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THE AUTOMOBILE

Fiat, Bruce-Brown, Wins Grand Prize

Scene When Bruce-Brown in the Winning Fiat Crossed the Tape in the Grand Prize at Savannah. The Winning Driver and His Mechanician

SAVANNAH, GA., Nov. 30—David Bruce-Brown, in a Fiat special racing car, to-day won the Grand Prize race after one of the most spectacular struggles ever seen in a road race in America. In this struggle Eddie Hearne, in a Benz, Ralph De Palma, in a Mercedes, and Ralph Mulford in a Lozier, were his greatest rivals. Brown put his Fiat over the 411.36 miles at an average pace of 74.45 miles per hour, scarcely 1-2 mile an hour faster than the Vanderbilt was won on the same course 3 days before. Brown won by the narrow margin of 2 minutes and 2 seconds over Hearne in the Benz; De Palma, in his Mercedes, was third, being but 3 minutes and 9 seconds back of the Fiat. Bragg, who finished fourth in a Fiat, was 20 minutes back of Brown.

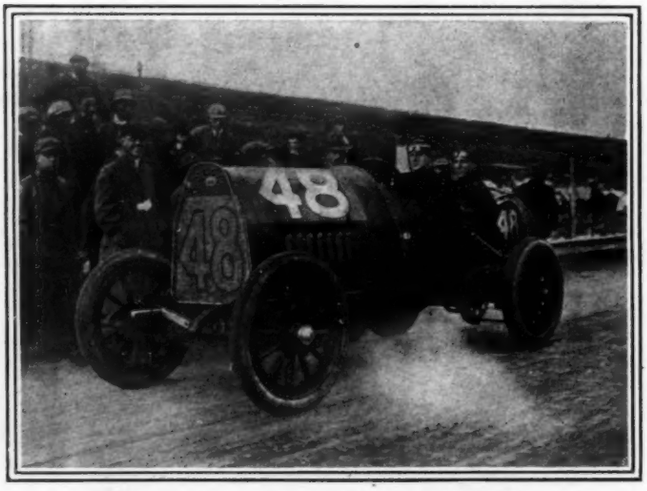
Mulford, in the Lozier, was less than 2 minutes behind Brown at the end of the twenty-second lap, but he went out in the first part of the twenty-third lap, due to breaking of the main shaft extension of the gearset.

TABLE SHOWING THE PERFORMANCE OF THE CARS IN THE GRAND

No.	CAR	DRIVER	Lap Miles	1 17.14	2 34.28	3 51.42	4 68.56	5 85.70	6 102.84	7 119.98	8 137.12	9 154.26
48	FIAT	David Bruce-Brown	Elapsed Time		25:54	38:52	58:31	72:17	85:31	98:38	111:38	124:31
			Lap Time	13:07	12:47	12:58	19:39	13:46	13:14	13:07	13:00	12:53
47	BENZ	Eddie Hearne	Elapsed Time		27:02	40:19	53:34	66:54	80:16	95:30	108:39	122:02
			Lap Time	13:43	13:19	13:17	13:15	13:20	13:22	15:14	13:09	13:23
55	MERCEDES	Ralph DePalma	Elapsed Time		26:25	39:49	53:08	68:20	86:06	99:29	113:02	126:34
			Lap Time	13:15	13:10	13:24	13:19	15:12	17:16	13:23	13:33	13:32
53	FIAT	Caleb Bragg	Elapsed Time		25:51	38:51	54:25	67:23	82:38	95:37	110:48	123:55
			Lap Time	13:01	12:50	13:00	15:34	12:58	15:15	12:59	15:11	13:07
42	POPE HUMMER	Louis Disbrow	Elapsed Time		29:27	43:57	58:39	73:12	87:47	102:15	116:50	131:27
			Lap Time	14:55	14:32	14:30	14:42	14:32	14:35	14:28	13:35	14:37
44	ABBOTT-DETROIT	L. A. Mitchell	Elapsed Time		32:43	48:52	64:50	80:55	96:57	112:45	130:27	148:37
			Lap Time	16:39	16:04	16:09	15:58	16:05	16:02	15:48	17:42	18:10
45	LOZIER	Ralph Mulford	Elapsed Time		27:20	40:59	54:46	68:06	81:54	95:37	109:25	123:03
			Lap Time	13:45	13:35	13:39	13:47	13:20	13:48	13:43	13:48	13:38
50	ABBOTT-DETROIT	Carl Limberg	Elapsed Time		31:54	47:30	63:00	78:47	94:17	111:53	127:40	143:29
			Lap Time	16:09	15:45	15:36	15:30	15:47	15:30	17:36	15:47	15:49
41	FIAT	Louis Wagner	Elapsed Time		26:16	42:00	55:32	68:40	81:40	96:42	109:37	122:50
			Lap Time	13:18	12:58	15:44	13:32	13:08	13:00	15:02	12:55	12:48
43	BUICK-HUNDRED	Charlie Basle	Elapsed Time		29:54	44:28	58:46	75:56	90:08	104:01	117:59	131:54
			Lap Time	15:02	14:52	14:34	14:18	17:10	14:12	13:53	13:58	13:55
51	MARMON	Cyrus Patchke	Elapsed Time		27:59	41:25	54:46	68:10	81:32	94:55	108:16	
			Lap Time	13:57	14:02	13:26	13:21	13:24	13:22	13:23	13:21	Out—
54	MERCEDES	Spencer Wishart	Elapsed Time		27:19	70:07	83:55	97:20	110:45	124:16	140:15	
			Lap Time	13:37	13:42	42:48	12:48	13:25	13:25	13:31	15:59	Out—
52	BENZ	Erwin Bergdoll	Elapsed Time		27:14	40:48	54:10	70:45	99:19	137:05		
			Lap Time	13:37	13:37	13:34	13:32	16:35	28:34	37:46	Out — Second gear	
56	BENZ	Victor Hemery	Elapsed Time		26:23	89:07	136:58	149:34	174:59	187:42		
			Lap Time	13:17	13:06	62:44	47:51	12:36	25:25	12:43	Out — Broke ex.	
46	MARMON	R. Burman	Elapsed Time		27:35	40:58	54:22					
			Lap Time	14:01	13:34	13:23	13:24	Out—Sheared pins in magneto shaft coupling				
49	BUICK-HUNDRED	Harry Cobe	Elapsed Time		31:26							
			Lap Time	15:39	15:47	Out—Upset on turn						

FASTEST CAR IN EACH LAP

Lap	Car	Driver	Time	Speed
1	Fiat	Bragg	13:01	79.0
2	Fiat	Brown	12:47	80.4
3	Fiat	Brown	12:58	79.3
4	Benz	Hearne	13:15	77.6
5	Benz	Hemery	12:36	81.6
6	Fiat	Wagner	13:00	79.1
7	Benz	Hemery	12:43	80.8
8	Fiat	Wagner	12:55	79.6
9	Fiat	Wagner	12:48	80.3
10	Fiat	Brown	12:48	80.3
11	Benz	Hearne	13:22	76.9
12	Fiat	Wagner	12:51	80.0
13	Fiat	Bragg	13:08	78.3
14	Fiat	Wagner	12:48	80.3
15	Fiat	Brown	13:12	77.9
16	Fiat	Brown	13:16	77.5
17	Mercedes	DePalma	13:26	76.5
18	Fiat	Bragg	13:04	78.7
19	Fiat	Bragg	13:09	78.3
20	Fiat	Bragg	13:08	78.3
21	Fiat	Brown	13:01	79.0
22	Mercedes	DePalma	13:28	76.3
23	Fiat	Bragg	12:49	80.2
24	Fiat	Bragg	12:59	79.2



The winning Fiat, getting away after a stop at the pits

Brown's average of 74.45 miles an hour sets a new record for road races of this distance in America. By to-day's victory he was enabled to claim equal honors as a road race repeater with Harry Grant, winner of the Vanderbilt cup race last year, when he won it for the second successive time in an Alco car; and also with Thery, the celebrated European driver, who won the Gordon-Bennett race in 1904 and again in 1905 in a Brasier car.

Brown's victory this year was popular. Being the winner of the Grand Prize last year he was a strong favorite, with the masses and much speed was expected from his Fiat racer. His great rivals to-day before the race started, were Wagner in another Fiat and Victor Hemery in a Benz. Last year Hemery was but 1.32 seconds behind Brown, the year before he was but a few seconds behind Wagner who won in a Fiat, and this year many were looking to him to carry off the laurels. It was known in practice that he had the fastest car on the course and this was proved to-day when he made the fastest lap, averaging 81.61 miles an hour for a circuit. But luck was against him good and strong to-day. In the third lap he broke an exhaust valve and was over one hour making the circuit, which eliminated him as a contender, but he effected a repair and made seven laps when he was compelled to retire, due to the same trouble. Wagner, the winner of the grand prize race 2 years ago, was looked upon as a probable leader to-day, in fact, more expected him to win than Bruce-Brown, but he, too, was doomed to disappointment. He had many cases of tire trouble and in taking a turn too fast in the fourteenth lap ran off the course and damaged his steering-gear and withdrew when he reached the grandstand. With his elimination the two great European drivers were out and the American speed pilots on foreign and domestic cars were left to wage the battle.

TABLE SHOWING THE POSITION OF EACH CAR

No.	Car and Driver. Lap	1	2	3	4	5	6	7	8
48	FIAT, Bruce-Brown	2	2	2	8	8	6	5	6
47	BENZ, Hearne	7	6	4	2	1	1	2	2
55	MERCEDES, DePalma	3	5	3	1	5	7	6	7
53	FIAT, Bragg	1	1	1	5	2	5	3t	5
42	POPE-HUMMER, Disbrow	11	12	10	9	9	8	7	8
44	ABBOTT-DETROIT, Mitchell	15	16	13	12	12	11	10	11
45	LOZIER, Mulford	8	9	7	6t	3	4	3t	3
50	ABBOTT-DETROIT, Limberg	14	15	12	11	11	10	9	10
41	FIAT, Wagner	5	3	9	7	6	3	4	4
43	BUICK 100, Basle	12	13	11	10	10	9	8	9
51	MARMON, Patschke	9	11	8	6t	4	2	1	1
54	MERCEDES, Wishart	6t	8	14	13	13	13	11	12
52	BENZ, Bergdoll	6t	7	5	3	7	12	12	out
56	BENZ, Hemery	4	4	15	14	14	14	13	out
46	MARMON, Burman	10	10	6	4	out			
49	BUICK 100, Cobe	13	14	out					

PRIZE RACE OF THE A. C. A., SAVANNAH, GA., NOVEMBER 30, 1911.

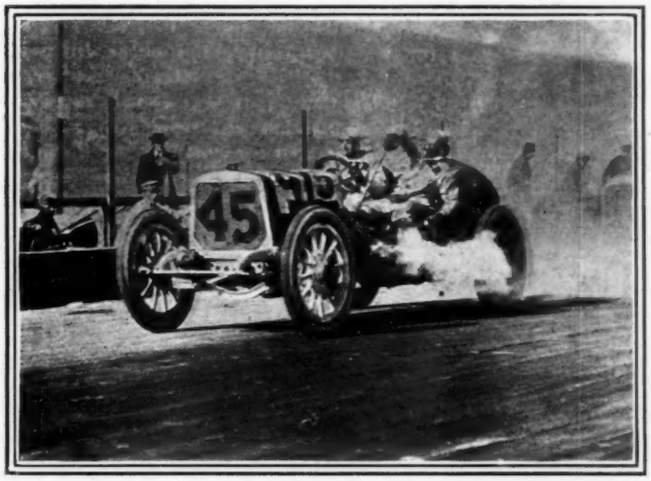
10 171.40	11 188.54	12 205.68	13 222.82	14 239.96	15 257.10	16 274.24	17 291.38	18 308.52	19 325.66	20 342.80	21 359.94	22 377.08	23 394.22	24 411.36	Miles per Hour
137:19	152:30	166:15	179:27	195:19	208:31	221:47	237:12	250:23	263:46	277:04	290:05	305:24	318:17	331:29.13	74.45
12:48	15:11	13:45	13:12	15:52	13:12	13:16	15:25	13:11	13:23	13:18	13:01	15:19	12:53	13:12	
135:22	148:44	162:11	178:27	192:12	206:57	220:24	234:08	248:07	263:03	277:35	290:41	304:42	319:47	333:33.07	74.04
13:20	13:22	13:27	16:16	13:45	14:45	13:27	13:44	13:59	14:56	14:32	13:06	14:01	15:05	13:46	
140:06	153:34	167:08	180:42	194:19	208:00	224:55	238:21	251:52	267:25	281:16	294:44	308:12	321:26	334:40.80	73.76
13:32	13:28	13:34	13:34	13:37	13:41	16:55	13:26	13:31	15:33	13:51	13:28	13:28	13:14	13:14	
137:11	165:55	178:54	192:01	207:59	221:44	235:17	248:55	261:59	275:07	288:15	309:43	326:03	338:52	351:55.29	70.13
13:16	28:44	12:59	13:08	15:57	13:45	13:33	13:38	13:04	13:08	13:08	21:28	16:20	12:49	12:59	
146:13	171:01	184:44	199:25	214:08	233:59	249:42	276:31	298:15	313:11	327:49	342:34	357:23	372:04	386:44.60	63.84
14:46	23:48	14:43	14:41	14:43	19:51	15:43	26:49	21:44	14:56	14:38	14:45	14:49	14:41	14:40	
165:26	181:45	198:04	214:18	230:34	246:51	270:42	287:17	304:02	320:35	337:32	355:48	374:04	393:36		60.09
16:49	16:19	16:19	16:14	16:16	16:17	23:51	16:35	16:45	16:33	16:57	18:16	18:16	19:32	Running at end of race	
140:07	154:00	167:39	181:12	194:50	208:28	222:05	235:45	249:28	263:18	277:18	291:13	305:08	Out—		
17:04	13:53	13:39	13:33	13:38	13:38	13:37	13:40	13:43	13:50	14:00	13:55	13:55	Broke rear axle drive shaft		
159:05	174:39	190:26	206:04	224:41	241:04	257:02	272:51	307:38	336:17	353:02	374:05				
15:36	15:34	15:47	15:38	18:37	16:23	15:58	15:49	24:47	28:39	16:45	21:02	Running when race was called			
136:56	152:14	165:05	179:48	192:36											
14:31	15:18	12:51	14:43	12:48	Overran turn and injured steering gear										

Engine trouble

Cracked cylinder

could not be disengaged

valve



The Mulford Lozier looked like a winner at one stage of the race

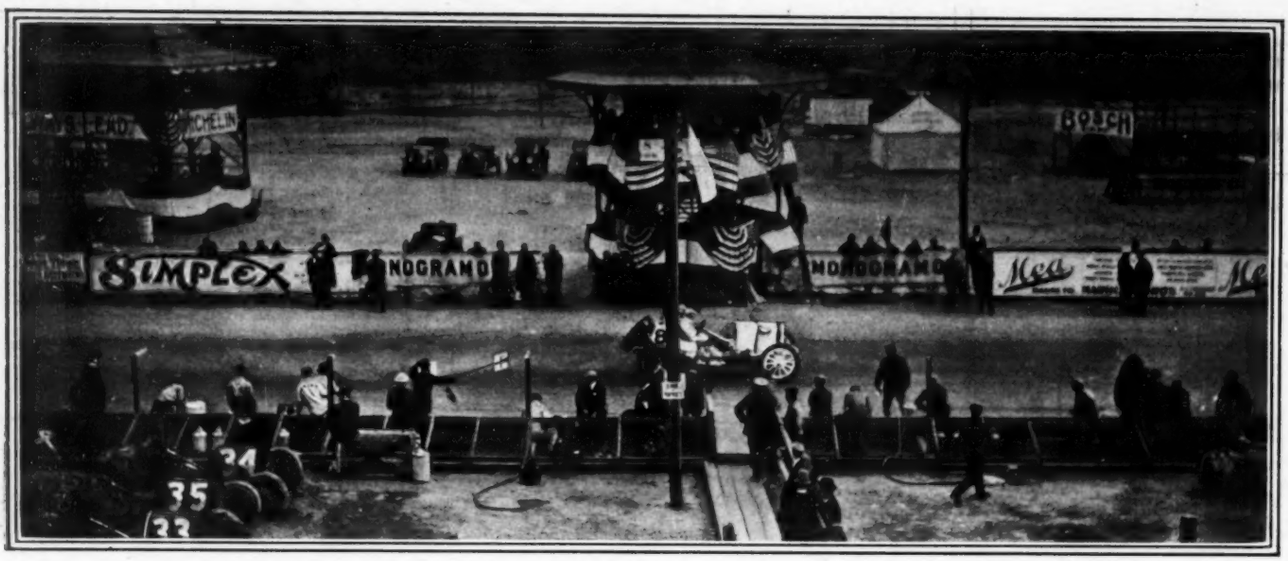
A cursory analysis of the performance of Brown in his Fiat will show what difficulties he had to contend with from start to finish. His task was not that of defeating Hearne, or Mulford or De Palma, but at different stages of the contest he had to battle with the speedy Wagner, with the equally speedy Bragg, with the speed king Hemery, with Patschke and with Burman. He ran second for the first three laps, then dropped to eighth place which he held for a couple of circuits. He mounted to sixth in the sixth lap; went to fifth in the seventh; only to fall back to sixth in the eighth. In lap nine the dropping out of Patschke raised him one and he gained another due to the fortunes of tires in road racing, so that at the end of the circuit he was in fourth place. He remained fourth in laps nine and ten; was third in eleven and twelve; and was second in lap thirteen, being exactly 1 minute back of the flying Hearne in the Benz. But when almost within striking distance of first he stopped to change tires, made a slow lap in 15:52, Benz took the lead and Brown found himself in fifth place. Then he had to begin climbing all over again. But he kept steadily at it. By the end of lap fifteen he was back in third place having got in in advance of Bragg in the other Fiat, and also the Lozier. Lap sixteen saw him in second place with the Benz ahead; but he dropped to third in laps seventeen, eighteen and nineteen. Then at one fell swoop he jumped ahead of both Hearne and Mulford, and took first place. He held it for lap twenty-one, but Hearne was close on his heels, being only 36 seconds back of him and Mulford little more than a minute in the rear. Then came the fatal end of the twenty-second, when all three of them stopped. Fiat got away with an advantage of over a minute on the Benz and it was all over but the shouting, because Brown was first in the twenty-third lap and first in the twenty-fourth. Through

THEIR FASTEST LAPS

No.	Car	Driver	Lap	Time	Speed, Miles per Hour
56	BENZ	Hemery	5	12:36	81.61
48	FIAT	Brown	2	12:47	80.50
41	FIAT	Wagner	9	12:48	80.3
53	FIAT	Bragg	22	12:49	80.2
47	BENZ	Hearne	21	13:06	78.5
55	MERCEDES	DePalma	2	13:10	78.1
45	LOZIER	Mulford	5	13:20	77.1
51	MARMON	Patske	4	13:21	77.0
46	MARMON	Burman	3	13:23	76.8
54	MERCEDES	Wishart	5	13:25	76.6
52	BENZ	Bergdoll	4	13:32	75.9
43	BUICK	Basle	7	13:53	74.0
42	POPE	Disbrow	7	14:28	71.0
50	ABBOTT	Limberg	4	15:30	66.30
49	BUICK	Cobe	1	15:39	65.70
44	ABBOTT	Mitchell	6	16:02	64.1

AT THE END OF EACH LAP OF THE GRAND PRIZE

9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	4	3	3	2	5	3	2	3	3	3	1	1	3	1	1
1	1	1	1	1	1	1	1	1	1	1	3	2	1	2	2
6	5	4	4	4	3	2	4	4	4	4	4	4	4	3	3
5	3	6	6	6	6	5	5	5	5	5	5	5	5	4	4
7	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5
10	9	9	9	9	9	8	8	8	7	7	7	7	7	6	6
3	6	5	5	5	4	4	3	2	2	2	2	3	2	out	
9	8	8	8	8	8	7	7	7	8	8	8	8	running		
2	2	2	2	3	2	out									
8	out														
out															



Looking across the track from the paddock. The pits are in the foreground and the timers' stand on the opposite side of the track

all of this changing, the like of which was never before seen in a road race in this country, Brown worked coolly along. He changed twelve tires from start to finish. He changed all of these at the pits, seven being changed at the tire repair station on the backstretch and five at the grandstand pits. In five of the stops he changed two tires at a time, both rear wheels and in the other two stops he changed one tire each. He did not make a tire change at any point along the course.

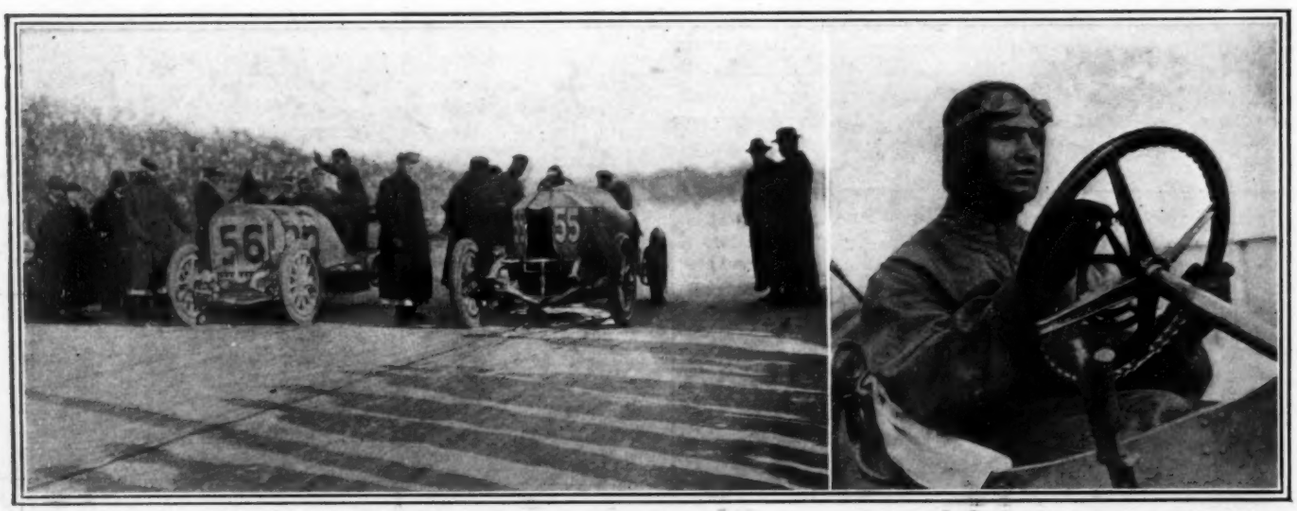
Most Thrilling Race in America

To-day's race was one of the most spectacular ever seen in America. There were sixteen cars that faced the tape and got away in good shape. Of these only five finished the twenty-four laps, but two more, the Abbott-Detroits, were running at the finish. Nine cars were compelled to give up the gruelling struggle. From the start to the end of the twenty-second lap the race might have been won by Brown in the Fiat, by Hearne in the Benz, by Mulford, in the Lozier, or by De Palma, in his Mercedes. At this point Hearne led, being 24 seconds ahead of Mulford and 42 seconds ahead of Brown; De Palma was over 3 minutes back. It required only a little unexpected tire trouble to make any one of the three a leader. Hearne had his in the second to the last lap and in the same lap Mulford was retired, leaving the course clear for Brown and his Fiat.

From start to finish the race was one of never-ending interest. The leadership changed no fewer than seven times in the twenty-four laps. Caleb Bragg, in a Fiat, a duplicate of the one Brown drove, led for the first three circuits, but fell behind De Palma in the fifth, due to tire troubles; De Palma held the lead for but a single circuit when it fell into the keeping of Eddie Hearne and his Benz who maintained it for laps five and six. Then he dropped it into the hands of Cyrus Patschke in his Marmon, who held it for laps seven and eight, when he dropped out of the race. From the start of the race Hearne had been making laps in 5 to 6 seconds under Patschke, so that as soon as tire troubles overtook him, Patschke was ready to grab the lead. When the Marmonite eliminated himself at the end of the eighth with engine troubles, Hearne was at hand, being only 9 seconds behind, and took the lead in the ninth with a margin of 1 minute over the Lozier and about the same on Wagner. Hearne held this lead until the twentieth lap, when for the first time, it fell into the hands of Bruce-Brown, who for the five previous laps had been steadily cutting down the lead Hearne had established earlier in the race. When Brown took the lead in lap twenty, he had only 31 seconds on Hearne, but he kept it and led in lap twenty-one by 36 seconds.

Lap twenty-two saw a change of leadership when Hearne by his dogged perseverance once again got into the front rank with a lead of 42 seconds on the Fiat, which lost its advantage, due to tire troubles.

Here, with only two laps to go, came the catastrophe. Brown, Hearne and Mulford all stopped at the pits. They were all there



De Palma's Mercedes and Hemery's Benz were the last away. De Palma ready for the word

The immense crowd at the grand stand included automobile enthusiasts of every section of the country

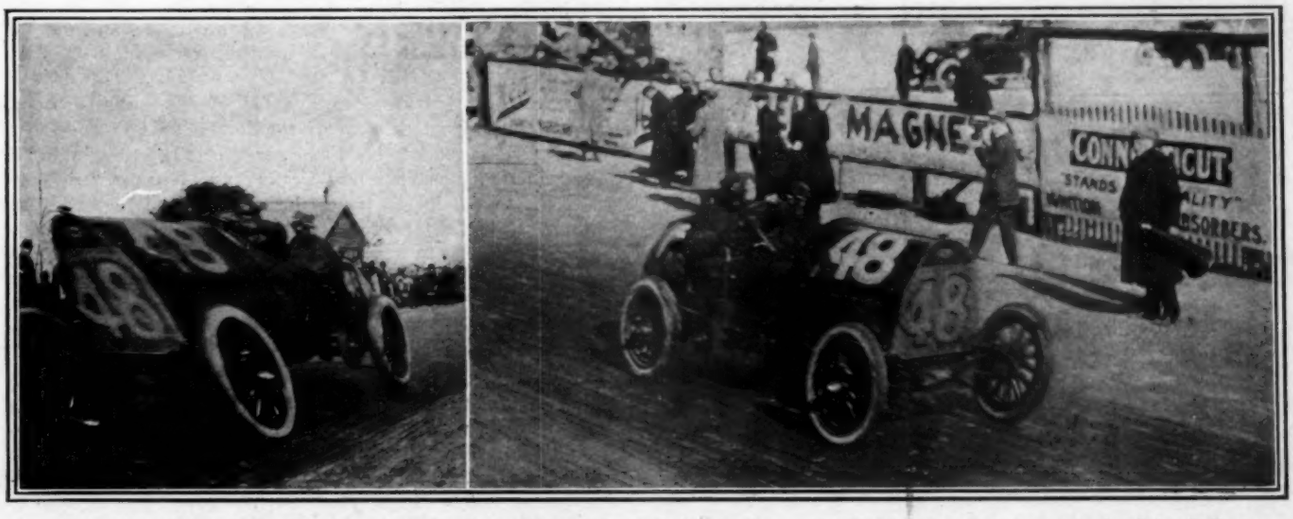
together. It was the most exciting moment ever witnessed in this or any other country in a road race. The Fiat was first into the pit to change tires. Not more than 3 or 4 seconds later came Mulford and then Hearne. Lozier took on gasoline only and was first away. Fiat second and Benz last. Everybody knew that the Fiat could make the fastest lap and so it did. It took first place in the twenty-third lap and held it for the twenty-fourth, winning by a margin of over 2 minutes. Many thought the Benz would have won if it had not stopped to change tires, but no one really knows. Hearne was fatigued from driving and would not take any chances in holding the car on the turns should a tire go. As it was Brown proved himself the same wonderful uphill fighter he was a year ago and Mulford and Hearne endeared themselves to every one by putting up the gamest fight that has been witnessed in a road race. De Palma, who finished third, was a strong favorite all day.

The elimination story was a particularly heavy one in that of the sixteen starters only five finished the twenty-four laps, and of these the Pope, driven by Disbrow was the only American car. Two other American cars were consistently running at this time, one being No. 44 Abbott-Detroit, piloted by Mitchell, and the other No. 50 Abbott-Detroit, driven by Limberg. Mitchell covered twenty-three laps of the circuit when he was flagged off and Limberg had negotiated twenty-one laps when he was called off, the race being declared over and the course thrown open. Had the two Abbotts been allowed to finish, which they undoubtedly would have done, it would have given America three cars at the finish as compared with four foreign machines that completed in the entire race.

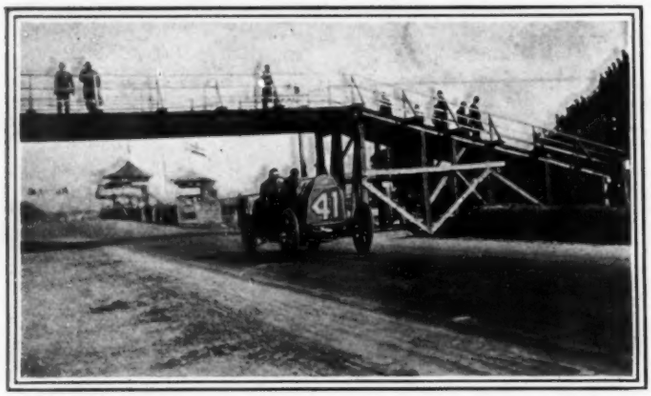
Why the Cars Dropped Out

When it comes to the story of why the cars dropped out, attention is first drawn to the foreign ranks, as they were the first to be broken. Hemery was first in trouble, due directly to an exhaust valve giving away under the terrific speed. Undoubtedly the speed at which Wishart pushed his Mercedes was more or less responsible for the cracked cylinder, which caused his withdrawal. Bergdoll's trouble was not being able to shift from second speed. Wagner was eliminated by too fast driving on the curves and putting his steering-gear out of commission when he ran off the road. The other four foreign cars finished.

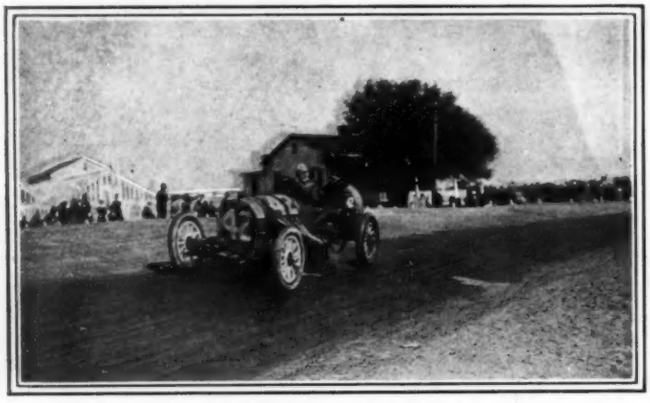
Five American cars were eliminated. First out was Cobe, in Buick, who upset on a curve. He was the first to give up the race. Second to drop out was the special Marmon car, driven by Burman. It stopped just before reaching the grandstand at the start of the fifth lap. The trouble consisted in the sprocket on the magneto shaft being destroyed. In lap 10 Patschke, driving the other Marmon withdrew, due to cylinders being loosened from the crankcase. He was leading when he pulled out. Basle, in a Buick, was next, dropping out in the following circuit. Mulford, in a Lozier as already stated, fell out in the start of the twenty-third lap, his trouble being the breaking of the main shaft



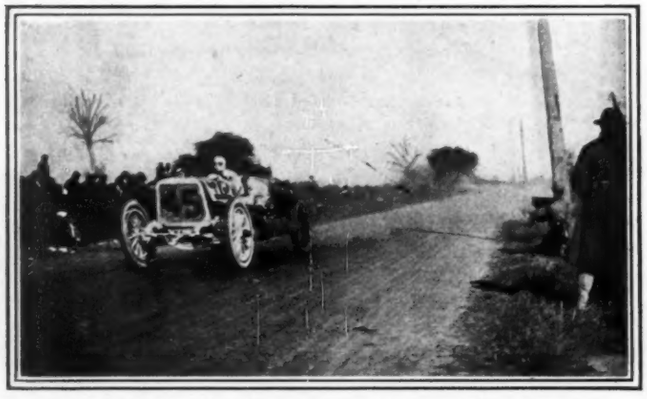
Two views of the winning Fiat in action. On the backstretch the staff photographer was enabled to get a close shot at the fast-flying Italian



Wagner's Fiat endeavoring to make up lost time



The Pope-Hummer did excellent work throughout the race



Mulford's Lozier in full cry at the head of the stretch

What caused Hearne to lose a very comfortable lead

Scenes Here and There

extension of the gearset. This shaft protrudes from the forward end of the gearbox and unites through a sliding joint and universal coupling with the clutch. Examination showed a slight flaw in this part, despite which the shaft proved sufficiently strong to carry the car to victory through the seventeen laps of the Vanderbilt Cup race and for twenty-two laps of the Grand Prize event.

Grand Prize in Detail

Lap 1—The foreign half of the racers set out to win everything in the first lap and when the end of the circuit was over, the eight foreign cars were in the van and the eight American cars in a group at the rear. The foreign eight averaged 77.3 miles an hour, as compared with an average of 68.7 miles an hour for the eight domestic cars, a difference of practically 9 miles an hour, a big handicap for the opening circuit. Bragg in his Fiat led the field by making the 17.14 miles from a standing start in 13:01, a speed of 79 miles an hour. But he was not alone, Brown in another Fiat averaged 78.4 miles an hour; De Palma in the Mercedes averaged 77.9; Hemery in a Benz 77.7; Wagner in a Fiat 77.6; Bergdoll in a Benz 75.4, and Wishart, Mercedes, 75.4. Hearne, Benz, who finished second in the race, was last of the foreigners in this lap with an average of 74.9 miles an hour. Mulford, who headed the American octette was close on the heels of Hearne, being but 2 seconds slower in the lap; Patschke with his Marmon was 12 seconds slower, and Burman in the other Marmon 16 seconds behind. Burman was just a minute slower than Bragg for the lap.

Thus did the first eleven racers complete the lap with only a minute's difference between the fastest and slowest. The remaining five cars were slower, as follows: Disbrow, Pope-Hummer, 14:55; Basle in Buick, 15:02; Cobe in Buick, 15:09; Limberg in Abbott-Detroit, 16:09, and Mitchell in Abbott-Detroit, 16:39, the last being at a pace of 61.7 miles per hour. There was a difference of 3 minutes 38 seconds between Bragg, the leader and Mitchell, the tail-ender.

Lap 2—The second circuit saw the eight foreigners still in a group at the front, with the eight American machines bunched in the rear. But there was only 1 second between Wishart, who was last in the foreign contingent, and Mulford's Lozier that was leading the home squadron. This was a Fiat lap, as they led in one, two, three fashion at this point, the order being Bragg, Brown and Wagner, with Victor Hemery, hope of the Benz camp, but 7 seconds behind Wagner, who was looked upon as the fastest of the Fiat trio. This lap saw several changes of position.

By making the lap in 13:09, a speed of 77.5 miles an hour, Hearne jumped from the last of the foreigners up two places, and Wagner, by sending his Fiat over the 17.14 miles in 12:58, 79.3 miles an hour, climbed past De Palma's Mercedes and Hemery's Benz, so the foreigners at the end of the lap stood Fiat, Benz and Mercedes. Mulford still headed the American cars. He made the circuit in 13:35, 75.6 miles an hour, his lap being 10 seconds faster than his first. Burman was second, having made the lap in 13:34, a second faster than Mulford, Patschke, dropped into third by a slower lap in 14:01. The positions of the other five American cars did not change, it being Disbrow, Pope; Basle, Buick; Cobe, Buick; Limberg, Abbott, and Mitchell, Abbott. There was at this point a difference of 6 minutes 32 seconds between the leader, Bragg, and Mitchell, who was bringing up the rear. Only two cars in this lap averaged over 80 miles per hour, these being the Bragg and Brown Fiats. Burman's Marmon was the fastest American car, doing the lap at

on Grand Prize Course

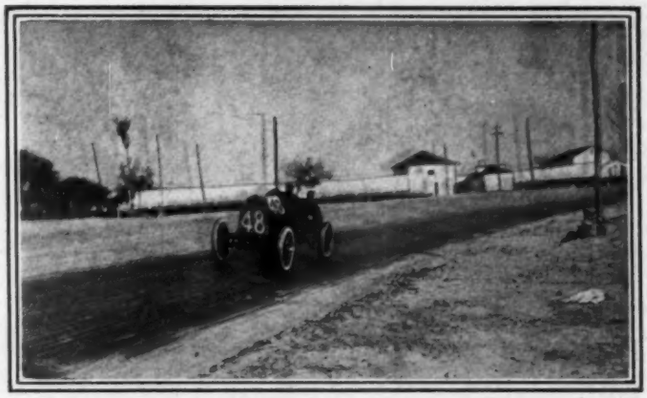
75.7 miles an hour with Mulford next, averaging 75.6 miles an hour.

Lap 3—This lap witnessed the breaking up of the united lead of the foreigners, Burman, Mulford and Patschke with their American cars having broken into the European phalanx, by getting ahead of Wagner's Fiat which had to stop at the grandstand pits for tires, they having passed Hemery's Benz that broke an exhaust valve and Wishart's Mercedes which had chain trouble. It was a case of five Europeans heading the race at this point, closely pursued by the three American cars, then Wagner's Fiat, next four Americans and last Hemery and Wishart, Cole's Buick went through the outer fence at the Montgomery cross road turn and upset. Fortunately nobody was hurt. This could not be looked upon in any other way than that of being a Fiat lap. Bragg and Brown were first and second, De Palma had his Mercedes in third, almost a minute back of the Fiats and the two Benzes were fourth and fifth, Hearne and Bergdoll being the order. This lap was a distinctive gain for the home cars, Burman averaging 76.8 miles per hour. Both of the Marmons were faster than Mulford's Lozier, the times being: Burman, Marmon, 13:23; Patschke, Marmon, 13:26; Mulford, Lozier, 13:39.

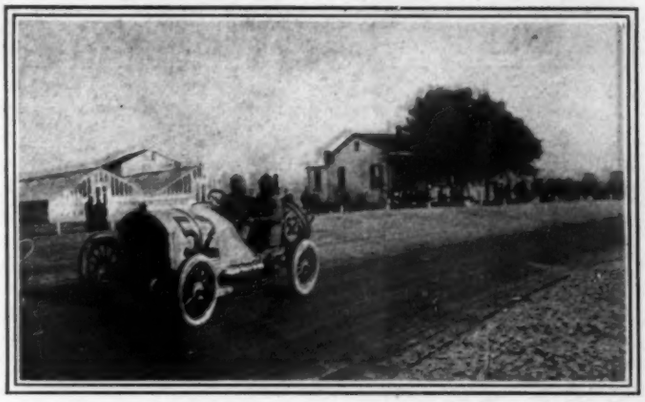
The remaining four American cars were running more than a minute to the lap slower than these three so everyone looked to Burman, Patschke and Mulford to wage the bitter war against the Fiats, Benz and Mercedes racing machines. Nobody knew at this moment what would be the outcome. The enormous speed of the foreigners had started to show its results in two different ways, in tires, Wagner having to change both rears after but three laps, and in mechanical troubles, both Hemery and Wishart's machines not being equal to the enormous speed possibilities of the course. Would Bragg and Brown still be able to maintain the 79-mile-an-hour pace they were setting? If they could the American car would have but little chance. Not taking into consideration Wishart and Hemery, who were tail-enders, there was at the end of this lap a difference of 10 minutes between the leader Bragg and Mitchell, last of those actually running steadily.

Fiat Loses the Lead

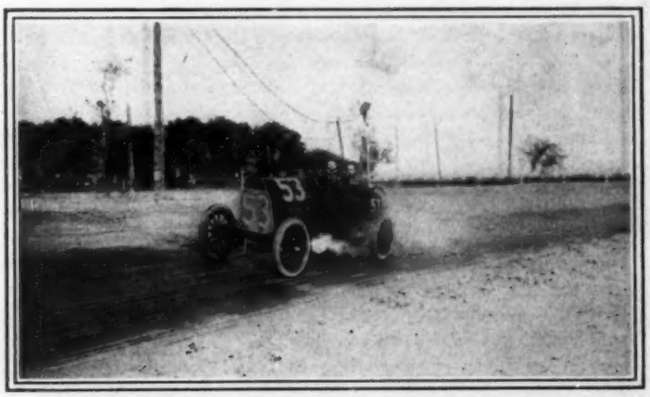
Lap 4—This lap was a Fiat catastrophe. For the first time the Italians lost the leadership, De Palma's Mercedes gaining first place, with Hearne and Bergdoll in the two Benz machines second and third and Burman's Marmon fourth. An American car had jumped from eleventh to fourth place in four laps. The Fiats' downfall was due to tires. Bragg had to change and so had Brown. Brown's stop was a long one, making the lap time 19:39, by far the slowest one he had in the entire Grand Prize race. He dropped abruptly from second to eighth place, and many thought that his hopes for victory had gone with his tires. The race was becoming interesting, with an American car fourth and two others sixth and seventh. Everyone felt settled that the Fiats could not continue their 79 miles an hour without having to change tires every three or four laps, and as the driver and mechanic had to do all of the tire changing work, it was problematic if the slower cars such as Marmons, Lozier, Benz and Mercedes, with fewer tire changes, would not win out. Everybody took a new view of the race at this point. The honor of the fastest lap went to Eddie Hearne in his Benz, his time being 13:15, his fastest lap so far, and a speed of 77.9 miles per hour. Few knew what Hearne could do with his car. He started last of the foreign group, being slowest in the first circuit, but in four laps he jumped into second place and showed that he had a car as fast as the De Palma Mercedes. It might be said that at the end of this lap there were seven strugglers in the lead and all



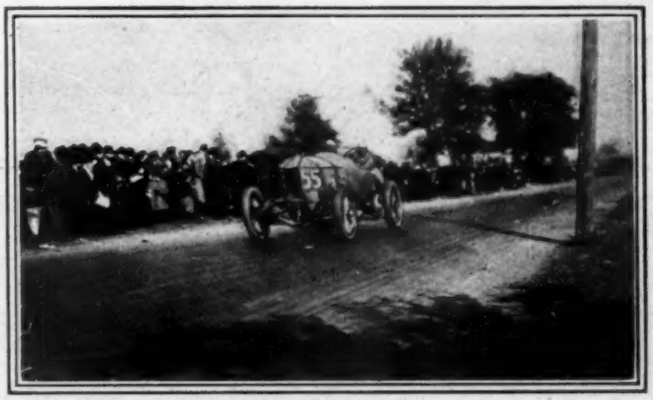
The winning Fiat negotiating the turn from Waters avenue



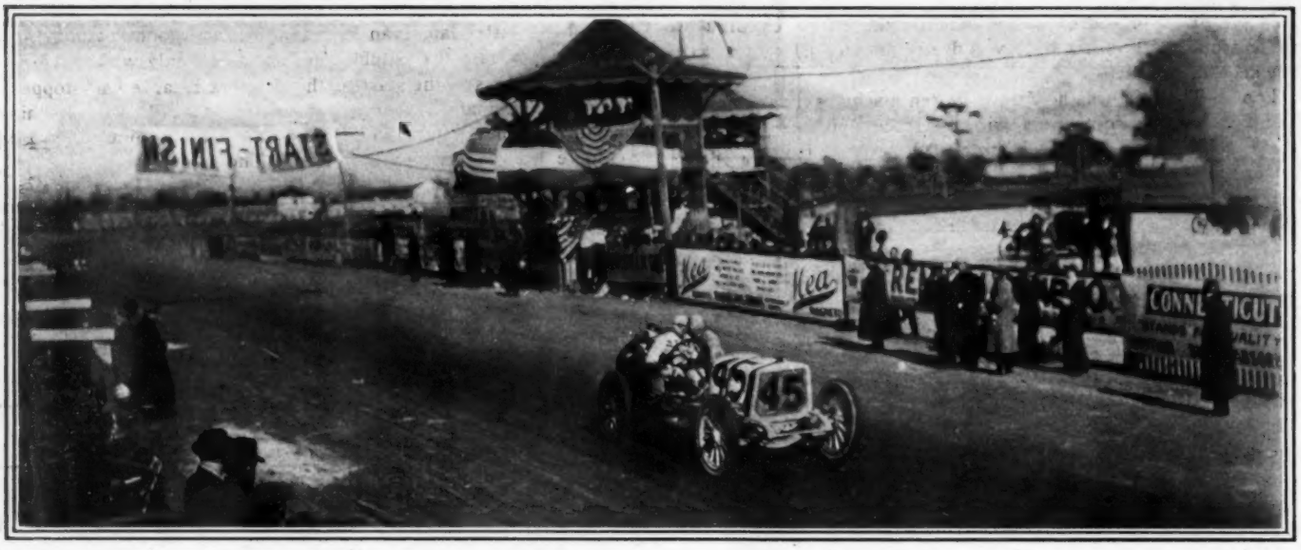
The Bergdoll Benz went out on the eighth lap with gear trouble



Caleb Bragg drove Fiat 53 to a consistent race



De Palma's Mercedes on the Waters road at 80 miles an hour



Scene on the homestretch in the nineteenth lap, when Mulford's Lozier was within a few seconds of the lead

within 2 minutes of each other. De Palma, the first of the seven, had made the four laps in 53:08 and Wagner, the slowest, in 55:32. Brown's Fiat was not reckoned in this group as its time was 58:31, but a few seconds ahead of Basle's Buick and the Pope. In this lap Hemery limped past the grand stand and drew off to the side of the road to change a new exhaust valve. He was over an hour in making the third circuit and 47 minutes in the fourth, so that he was nearly 1 1-2 hours back of the leader and out of the race, excepting that he announced he was going to make a repair and go after the fastest lap. Wishart with his Mercedes was now 1-2 hour back of the leaders, and there was 11 minutes between the first and the last of the thirteen cars that were running steadily at this point.

Lap 5—This was an unfortunate lap for American representation as it saw Burman's Marmon drop out when it was running in fourth place and leading the American representation by a matter of 32 seconds over Mulford and Patschke who had tied in lap four at 54:56. When Burman fell out Mulford took up his scepter, having gained 4 seconds on his rival, Patschke, in the fifth circuit. The remainder of the Americans, namely, Buick, Pope and the two Abbotts, were running in this order, the same as from the opening lap. The home representation had now dropped from eight to six, with Mulford and Patschke to look after the fast Italian and German cars. The end of this lap saw Hearne in the lead, having got ahead of De Palma who had trouble with a leak in the gasoline line which compelled him to use an auxiliary gasoline line that he already had attached. Hearne now led with a margin of but 29 seconds over Bragg; and Mulford and Patschke were not 2 minutes behind. Then came Wagner, Bergdoll and Brown. Brown was 6 minutes back of Hearne. Hemery fulfilled his previous announcement of going after the fastest lap of the race and he won it, doing the circuit in 12:36 or a speed of 81.6 miles per hour, the fastest official lap ever made on the course. He drove with all his old-time fearlessness. He took all of the turns very fast. When he shot into the homestretch everybody saw by his tremendous speed that he was after the coveted mark. He was slow in shutting down for the grandstand curve and struck it at apparently 70 miles per hour. Entering the turn he held close to the inside, but the momentum of the car was too great to hold it and he skidded wide, almost to the upper side of the bank. He soon straightened up and roared past the grandstand. His skid was the only really bad one made by any of the big cars on the turn, and the hundreds in the grandstand who wanted to see such a performance were satisfied. Bragg sustained his previous reputation by making the second fastest lap in 12:58, the only other one to get under the 13-minute mark. His pace was 79.3 miles per hour.

Lap 6—There was a general changing of positions in this lap, Hearne retaining the lead, but being about the only one of the leaders to hold his place. He had a lead of only 50 seconds on De Palma and but little over a minute on Patschke, Mulford and Wagner. The two Fiat drivers, Wagner and Brown, were closing the gap between them and Hearne, both doing the lap in several seconds under Hearne. Patschke and Mulford were third and fifth, disputing every inch of the course with De Palma and Wagner who was running a little slower than in the early laps and apparently taking more care of his tires. Brown made the lap in 8 seconds less than Hearne, but Wagner had the fastest circuit of the lap in 13:00, 79.1 miles per hour.

Marmon Takes the Lead

Laps 7 and 8—These were the brilliant laps for the American contenders, because Cyrus Patschke put his Marmon racer to the front and led the entire field—the only two laps in which the American colors led—but unfortunately the pace he set was apparently too strenuous, for he withdrew in the ninth lap, leaving Mulford to do the fighting single-handed against the five foreigner drivers who along with Mulford were making the race at this time. At this point Bruce-Brown was not very much in the limelight. He was still back in sixth place, not having recovered from that terrible setback in the fourth lap. But he was slowly coming out of the darkness, doing laps in 30 to 40 seconds lower than Mulford and Hearne. The seventh was a bad lap for Hearne. He had tire troubles, made a slow lap in 15:14, but hung onto second place by 7 seconds over Mulford and Bragg, who were tied for third place. At this point the positions were: Patschke, Marmon, 94:55; Hearne, Benz, 95:30; Mulford, Lozier, 95:37; Bragg, Fiat, 95:37; Wagner, Fiat, 96:42; Brown, Fiat, 98:38; De Palma, Mercedes, 99:29.

These were the fighting seven, the other seven trailing along far behind and practically out of the race. De Palma had fallen from second place in the sixth to sixth place in the seventl due to his gasoline lead. This advanced all of the other racer. one place. The first four were not separated by a minute at the end of lap seven or 120 miles, good proof of the desperate struggle that was taking place. Lap eight was a duplicate of lap seven, excepting that Wagner climbed above his team mate Bragg by a lap in 12:55 or 79.6 miles per hour. This lap marked the start of Bragg's bad luck. An oil lead at the forward end of the motor broke, due to the vibration. It was a hard place in which to make a repair and he blistered his hands in doing the work. He also had to make a tire change on the course and stopped at the grandstand to take on a new shoe. Brown gained from 9 to 10 seconds on Mulford and Hearne in the circuit.

Hemery finally withdrew at the end of the eighth circuit with valve trouble. Wishart also withdrew his Mercedes, due to a cracked waterjacket.

Lap 9—The field was now down to ten machines, five American and five foreign contenders with the race not half over. Of these ten, the first six were making the race, the order at the end of this lap being Hearne, Wagner, Mulford, Bragg, Brown and De Palma with only 4.5 minutes between the first and the last. The three Fiats made the fastest laps, 12:48, 12:53 and 13:03. They were 1-2 minute faster than any of the others in the lap and so everybody wondered if the Fiat colors would again come into the lead, they having been in the background since the third lap.

Lap 10—Hearne increased his lead on Wagner who stopped for oil and gasoline and also changed tires, making his lap a slow one, 14:31, as compared with 13:20 by Hearne. But Brown, though down in fourth place, was traveling fast. He reeled the lap off in 12:48, over 80 miles an hour, and was scarcely 2 minutes behind the leader at this point. He was steadily gaining. De Palma stopped 3 minutes and 30 seconds for gasoline and oil as well as to change a right rear tire and so found himself dropped from third to fifth place. Basle, who had been running in seventh place, dropped out due to engine troubles.

Looked Like Hearne Victory

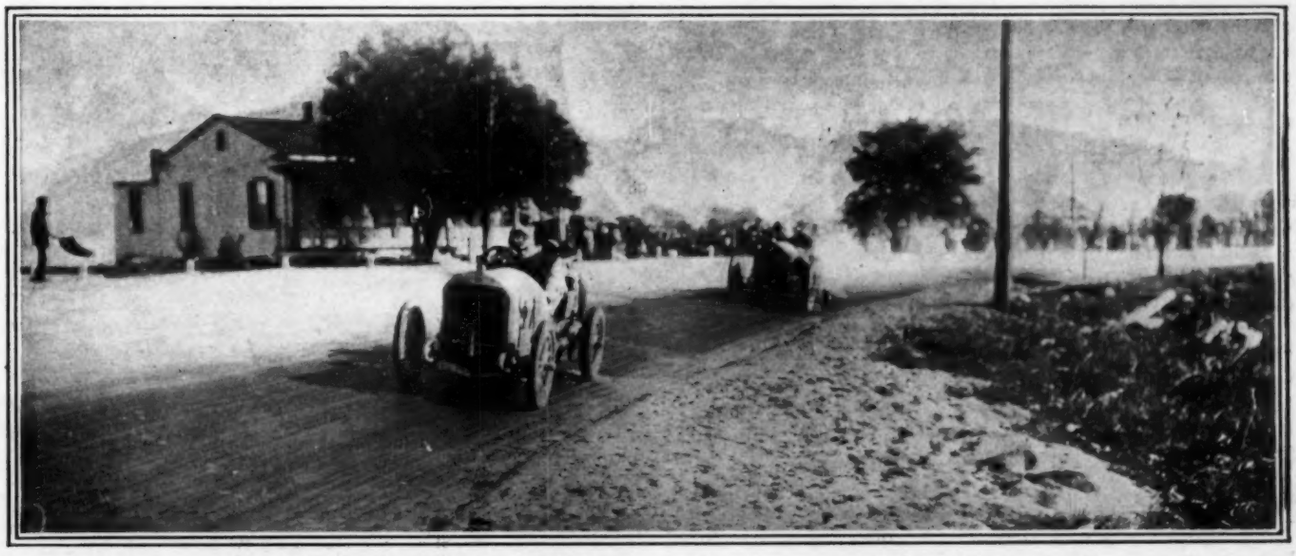
Laps 11 and 12—Lap eleven saw Hearne running steadily in the lead with Fiats second and third and 4 minutes behind him, Wagner and Brown being the chasers. De Palma and Mulford were close up but Bragg was 10 minutes in the background. In lap twelve the positions were the same as in lap eleven, this being about the only case of two successive laps in the race in which positions did not change, with the exception of lap twenty-four, in which they were the same as in lap twenty-three. Hearne's time was the fastest in lap eleven, it being 13:22. Hearne led in lap twelve, but stopped 2 minutes 35 seconds for gasoline and oil and tires. Wagner and Bragg made the fastest circuits, doing close to 80 miles an hour. There was now an interval of 36 minutes between the leader Hearne and Mitchell's Abbott. Through all of these laps the Pope-Hummer, piloted by Disbrow, and the two Abbott-Detroits were showing their dogged consistency, going lap after lap at a steady pace. Disbrow was making nearly all of his circuits in 14:38, and the two Abbott-Detroits about a minute to the lap slower. With the race half over Hearne had a lead of 3 minutes on Wagner's Fiat and 4 minutes on Brown's Fiat. He was 5 minutes ahead of De Palma in the Mercedes and 5.5 minutes lead on Mulford. He seemed to be in a safe position, excepting that it was known the Fiats could make faster laps than he, and if he had good fortune and the Fiats met with tire troubles he would certainly win.

Lap 13—It was in the start of this lap that Hearne had stopped for fuel and made a very slow lap, 16:16. Brown put his Fiat around the circuit in 13:12 and so cut off 3 minutes of the 4-minute lead Hearne had enjoyed. The five leaders, Hearne, Brown, Wagner, De Palma and Mulford, now were more closely bunched than at any other time since the start. It was proving a wonderful race. Hearne was just a minute ahead of Brown. Brown was only 21 seconds ahead of his team mate, Wagner, De Palma was but a minute back and Mulford 1-2 minute behind De Palma. It was now anybody's race. These battlers were almost 20 minutes ahead of the Pope and the Abbotts. Brown was now second and only a minute from leadership. All expected him to cut that minute off in the next lap and take the lead from Hearne who had held it for five successive laps.

Lap 14—The unexpected happened. Instead of taking the lead from Hearne, Brown stopped for tires, was stopped 1 minute 20 seconds at the pit and found himself fifth or last in the bunch of leaders. Never before was there such a five-sided duel. It meant but a tire change to alter the entire state of affairs. A mere stop of less than 2 minutes made the first last and the last first. Wagner was the hero of the lap, making the circuit in 12:48 at a speed of 80.3 miles an hour. It put him in second place, only 24 seconds back of Hearne. He now was looked upon as the leader in the following lap. De Palma and Mulford were 2 minutes back of Wagner and Brown a minute behind them.

Lap 15—This lap was unlucky for the Fiats as Wagner was eliminated. His 80-mile pace of the previous lap was too much. He tried to duplicate in this circuit but overran a turn. Nobody knows exactly what did happen. But the rear axle was a little sprung and the steering out of commission. He drove to the grandstand and withdrew. This left but four leaders in the real fight, as Bragg was 12 minutes behind the group and he was in turn 10 minutes up on the Pope and 20 and 25 minutes on the Abbott. There were yet nine laps to go and the leaders stood in this order: Hearne, Benz, 206:57; De Palma, Mercedes, 208:00; Mulford, Lozier, 208:28; Brown, Fiat, 208:31. There was not 2 minutes between the first and the last.

Lap 16—This lap worked an upheaval; Brown passed both Mulford and De Palma and got in second place just 1 minute 25 seconds back of Hearne, almost as close to him as he had been three laps before. Brown was driving conservatively. For the last five laps he was making circuits in 13:12 or thereabouts, which averaged 30 seconds to the lap better than Hearne and apparently he had settled down to get into the lead by this kind of driving rather than by the terrific speeds that put Wagner out



Hearne's Benz passing Limberg's Abbott-Detroit on the wide curve leading from the Waters road

and also caused the oiling troubles on Bragg's Fiat. It was now really a single-handed fight among the Benz, Fiat, Lozier and Mercedes. Mulford, who started single-handed, was still in the ring; De Palma had lost his running mate in the ninth lap and both of Hearne's supporters were gone. It was now a real fight, and with the Fiat cutting the frills out the race was taking on a new aspect. It was real business and not sensationalism.

Lap 17—The great fight in this lap was between Hearne and Mulford, Hearne having the lead by only 27 seconds. Brown met with tire troubles and went slowly in 15:26, practically 2 minutes slower than the other three. Bragg was now running in fine shape but 15 minutes behind this group.

Laps 18 and 19—These two laps were races, the order being Hearne in the Benz, Mulford in the Lozier, Brown in the Fiat and De Palma in the Mercedes. Brown made each of these laps in 30 seconds under the other drivers and so found himself at the end of lap nineteen but 43 seconds from first place, the closest he had been from the start of the race. Hearne still led with Mulford second. This was the standing: Hearne, Benz, 263:03; Mulford, Lozier, 263.18; Brown, Fiat, 263:46; De Palma, Mercedes, 267.25. De Palma had lost his time on changing tires.

Lap 20—Brown leads. This was shouted everywhere, and for the first time the winner of the Grand Prize last year was able to put the Fiat colors to the front since the third lap when Bragg had placed them there. Yes, Brown led and led with but four laps to go. But his lead was only 14 seconds on Mulford and 31 seconds on Hearne. Brown gained his place by fast traveling, doing the circuit in 13:18, as compared with 14:00 by Mulford and 14:32 by Hearne.

Lap 21—The struggle continued, Brown increased his lead from 14 seconds to 36 seconds over Hearne and was over a minute ahead of Mulford. De Palma was 4 minutes back.

Lap 22—The end of this lap saw the most intense moment ever witnessed in a road race. It saw all three racers, Brown's Fiat, Hearne's Benz and Mulford's Lozier, stop at the pits together and with but two more laps to go. A driver will not stop at such an important time unless there is a reason. Brown was first into the stretch in sight of the grandstand. He was cheered to the echo. He slowed into the turn. "He is stopping" was heard on every hand. Back of him raced Mulford. He slowed also and stopped. The entire grandstand was on its feet. Scarcely was he at the pits than Hearne rounded the turn and stopped. Brown was 1 minute and 8 seconds changing a left rear tire; Mulford was 36 seconds taking on some gasoline, and Hearne was 1 minute changing a right rear tire. Many at the Lozier pit did not want Mulford to stop, but he had been signalled the previous lap to stop for fuel and did not take any chances. Many in the Benz pit thought Hearne should not have stopped, but it seems that he was fatigued from the long grind and would not take any chances with a poor tire on the turns. Mulford was first away. He dropped into second and shot off. Brown was hot after him and Hearne was last. According to the official figures, Hearne led for the lap. His time was 304:42; Mulford's time was 305:08, and Brown's 305:24. Brown was last, which was due to the fact that he did not cross the tape before repairing his tire whereas Hearne and Mulford did.

Laps 23 and 24—These were fatal to American interests. Scarcely had Mulford started on lap twenty-three when he went out of the running by twisting the clutch off the outer end of the axle-drive shaft. In taking a street-crossing the car bounded into the air and when the back wheel struck the ground the engine speed up and the car slowed down. Mulford knew the trouble and pulled to the side of the road. The remainder was a procession. Brown was leading. At the end of the twenty-third lap when he got the green flag he was 1 minute 30 seconds ahead of Hearne. Nothing but tires could stop him. The lap was a fast one, too, the time being 12:53 or nearly 80 miles per hour. De Palma was 3 minutes behind. In the last or twenty-fourth lap, Brown slowed down to 13:12, still 1-2 minute faster than Hearne, but only a couple of seconds faster than De Palma made the circuit. At this time Brown was laps ahead of the Pope and the two Abbott-Detroits. He was 50 minutes ahead of Disbrow and an hour ahead of the leading Abbott, all of which were lower-powered cars.

KlineKars Win Handily at York

YORK, PA, Dec. 1—KlineKars finished as winners yesterday afternoon in five of the seven events in which they were entered in the meet of the South Jersey Motor Club, on the York fair ground track. The track record for five miles was twice broken and a new record for one mile established. About 1,000 persons witnessed the races.

The first track record was broken in the third event, when the five-mile time was lowered by a KlineKar to 6:46 3-4 from 7:07. The best mile of the five was made in 1:24. The same car driven by Menker in the special handicap again established a new record, doing the five miles in 6:25 1-4.

Four events were omitted from the program, which originally included ten. These were the special handicaps for winners and losers, the time trials and the second heat of the division 20 class. For the time trials there was substituted a special handicap race between an Abbott-Detroit car driven by Padula and a Mercer driven by Ringler.

The event between Padula and Ringler provided a fast and exciting race. Ringler had his opponents' handicap of 20 seconds well made up by the sixth heat, but waited for the last mile before going in to win. Then, at full speed and taking the turns in a faultless manner, he closed up on the Abbott racer and beat Padula to the tape. The summary:

5-mile Non-Stock

Car	Driver	Position	Time
KlineKar	Menker	1	7:37¼
Abbott-Detroit	Padula	2	.....
Buick	Haupt	3	.....

5-mile Non-Stock

Car	Driver	Position	Time
KlineKar	Menker	1	7:25½
Mercer	Ringler	2	.....
Knox	Di Napoli	3	.....

5-mile Non-Stock

Car	Driver	Position	Time
KlineKar	Menker	1	6:46¼
Mercer	Ringler	2	.....
Knox	Di Napoli	3	.....

5-mile Non-Stock

Car	Driver	Position	Time
Abbott-Detroit	Padula	1	7:23¼
Buick	Lambright	2	.....

5-mile Special Handicap

Car	Driver	Position	Time
Mercer	Ringler	1	7:03¾
Abbott-Detroit	Padula	2	.....

5-mile Non-Stock

Car	Driver	Position	Time
KlineKar	Menker	1	7:21½
Knox	Di Napoli	2	.....

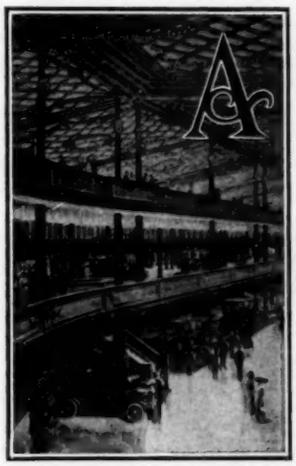
5-mile Special Handicap

Car	Driver	Position	Time
KlineKar	Menker	1	.....
Mercer	Ringler	2	.....
KlineKar	Sechrist	3	.....
Abbott-Detroit	Padula	4	.....
Buick	Haupt	5	.....
Buick	Lambright	6	.....
Knox	Di Napoli	7	.....

Loziers Are Shaft-Driven Cars

In last week's issue of THE AUTOMOBILE, in the story of the Vanderbilt race, the statement was made that "the Loziers are chain-driven machines," etc. Of course every well-posted automobilist knows that the car that won the Vanderbilt is shaft-driven. The car to which the writer had reference was the Mercedes, but through an unaccountable error the name Lozier was substituted.

News of Shows, National and Local



REVELATION in the decorating of automobile shows is promised at the twelfth national automobile show in Madison Square Garden, January 6 to 20. For several months past those in charge of the show have busied themselves producing a proper setting for the motor cars, motorcycles and accessories and no expense is to be spared to make the setting the most attractive ever seen in the historic building. Not only in the matter of decoration but in every other detail is the show committee striving to eclipse all former exhibitions. As this is to be the last automobile show to be held in the Garden, old patrons are assured of witnessing a spectacle which is bound to be lasting in their memory. As usual, the full description of the decorative scheme has been withheld by the show committee because of minor changes but it will soon be released. The Garden interior this year will be richer and more magnificent than for any previous affair, although perhaps more refined in treatment.

Partial M. & A. M. Show Program

Announcement has been made of a partial program for the Motor and Accessory Manufacturers during the approaching show season in New York. The annual meeting will be held at the Waldorf-Astoria, commencing January 10 at 10:30 a. m. The feature of this meeting will be the election of four directors. There is no well defined policy of succession in office in the M. A. M. and consequently the personnel of the official roster is uncertain.

The annual banquet, reputed to be one of the most elaborate of the metropolitan show season will be held at the Waldorf-Astoria, January 11, at 7 o'clock.

In addition to the big showing of the members of the association at the Madison Square Garden exhibition, it has been announced that twenty-eight of the members will show at Grand Central Palace.

The following new entries have been received by the Motor & Accessory Manufacturers, for the exhibitions arranged by the management:

For Madison Square Garden, for both weeks: Warner Instrument Co., Beloit, Wis.; first week only: Detroit Electric Appliance Co., Detroit, Mich.; Noera Manufacturing Co., Waterbury, Conn.

For Chicago show, both weeks: R. E. Hardey Co., Chicago, Ill.; Texas Co., New York City; U. S. Tire Co., New York City; first week only: Chicago Telephone & Supply o., Chicago, Ill.; W. F. Spocke Machine Co., Indianapolis, Ind.; Standard Thermometer Co., Boston, Mass.; Hess Springs & Axle Co., Carthage, Ohio.

Denver Space Almost All Gone

DENVER, Dec. 4—Definite arrangements for the annual Denver automobile show have been completed and under the auspices of *Motor Field* of this city the big event will be held at the Auditorium March 4 to 9. Already 14,500 of the 15,100 available feet of floor space has been assigned and it is expected that within the next week the allotments will be exhausted. Lively interest is being shown in the enterprise by the local dealers and it is expected that the Spring trade will show a decided advance over the slack fall business as a result of the attractive displays which will be made.

An effort toward building up the motor truck trade in Colorado will be made. One day will be designated as Motor Truck Day and rural dealers who have territory that is considered especially open to truck sales will be invited as guests of the management.

Importers Draw for Salon Space

Drawings for space at the coming show of the importers was held yesterday afternoon at the Hotel Astor. The show will open January 2 in the banquet hall of the hotel, occupying the same quarters as last year. Among the cars to be exhibited are the following: Renault, Itala, Isotta, Minerva, Opel, Benz, C. G. V., Darracq, DeDion, Napier, Picric, S. P. A., Metallurgique, Lancia and Mercedes.

Other Shows in Prospect

TOLEDO, O., Dec. 4—Toledo will have an automobile show this winter according to the plans which were definitely evolved this week. The show will be given under the direction of the Toledo Automobile Dealers' Association, January 15 to 20 inclusive and will be held in the large terminal railway building on Cherry street. It has been determined that the entire management of the exposition shall be placed in charge of Hugo V. Buelow, of Detroit, an expert in this line of work. The entire ceiling of the exhibition building will be of trellis, the walls will be covered with light blue bunting with a heavy flounce of old gold color. A carload of Southern smilax has been ordered from Alabama, 20,000 artificial roses will be made up, a large number of paintings to adorn the walls, statuary costing $5,000 and 10,000 incandescent lights will add to the beauty of the structure.

DAVENPORT, IA., Dec. 4—The directors of the Davenport Automobile Association have set the date for the annual automobile show on Feb. 28-March 2, which places the local exhibit between the St. Louis and Des Moines shows and thus enables dealers to arrange for exhibits at all three. This year the show date does not conflict with the Chicago Truck Show as it did last year. Half of the display this season will be trucks.

ROCHESTER, N. Y., Dec. 4—The Rochester Automobile Dealers' Association will hold its annual automobile show the week of January 22-27 in the State Armory. Pleasure cars, commercial vehicles and accessories will be shown. Great interest is being manifested by the public as well as by the dealers and a most successful exhibition is expected.

DETROIT, MICH., Dec. 4—At the second and final drawing for space for the 1912 Detroit automobile show, held in the offices of the Detroit Automobile Dealers' Association last week, the remaining 4,000 square feet of floor space was distributed among 13 independent concerns as follows: Oakland Motor Car Co., Anderson Carriage Co., Krit Motor Car Co., the Marquette Co., the Motor Wagon Co., W. A. Patterson, of Flint, Mich., the Hupp Corporation, Flanders Manufacturing Co., Commerce Motor Car Co., C. S. Briggs, showing his new "Detroiter," the Churchfield Motor Co., of Sibley, Mich.; the Miller Car Co. and the Grinnell Electric Co. An unusually elaborate decorative scheme is being worked out. The work will be performed by one of the largest decorating concerns in the United States.

Résumé of the 1911 Racing Season

NEW racing records were made in all departments of contest work in the automobile season of 1911. On beach, track, road, hill and speedway the flyers traveled faster than they ever had before. A new set of world speed marks was established in several of the classes.

The season of 1911 proves that the art of manufacturing automobiles is more perfect than it has been in the past, and the proof may be briefly cited from the single fact that the wonderful time made by a Fiat car over the 30-mile Florio road course in Italy several years ago was beaten this year by one or two American-made cars, approximately stock models, over shorter circuits.

On the speedways of Indianapolis and Los Angeles some remarkable performances were accomplished.

Dirt-track racing, while much less popular than before, showed decided progress in speed, while on the hills the general average of performance was much better than in 1910. Beach racing also demonstrated its value as never before.

The features of the 1911 season were the road races for stock cars and special racing machines. The stock cars only performed as such in one big meeting, while the special cars showed their paces in six major events.

Hairline finishes that marked the running of most of the big races in 1910 were absent this season. In 1910 the Fairmount Park, Vanderbilt Cup and Grand Prize were won by seconds and mighty few of them. This season the winning cars have had more margin, but in no case except the Fairmount Park race was the victory what may be termed hollow. Even then only about 3 minutes separated the first two cars.

The season has been strange from the rising of the curtain until its final drop. Starting off with the promise of an organized racing circuit to insure good fields and skilled administration for the speed events to be held in all the racing centers, the program flattened out and for a while it seemed that the knell of racing had been rung. The grand circuit idea found no favor with the manufacturers and under the circumstances it is remarkable that the Indianapolis race held May 30 proved to be such a popular event.

1—Herrick in the National, making new American road record at Santa Monica. 2—Wilcox in the National, breaking the record in the Dead Horse hill climb. 3—Ray Harroun, speedway champion of the world. 4—David Bruce-Brown, winner of the Grand Prize. 5—Witt, who created new 161-230 and under-160 records with E-M-F and Flanders.

This race was the longest and hardest contest for automobiles ever staged on a special speedway. It attracted the largest and most varied field of entries that ever faced a starter and the largest paid attendance in the history of the sport. It was a marvelous race won by a six-cylinder Marmon car accurately handled by Harroun in his only major start of the year, assisted by Patschke with some great speed work.

The world's speed record in a road race was established October 14 in the annual Santa Monica road race at Los Angeles, when a National car driven by Herrick averaged 74.628 miles in an hour for 202.08 miles. The record made by the National in

this event stands as the official mark for a completed race, but the time made by the car for 202 miles has been exceeded twice. The Lozier car in winning the Vanderbilt Cup averaged a fraction more per hour and the Benz car that finished second in the Grand Prize made 76.2 miles an hour for twelve laps. But these marks are at best intermediate records and as the figures show the rate of speed made over the shorter distance was not maintained

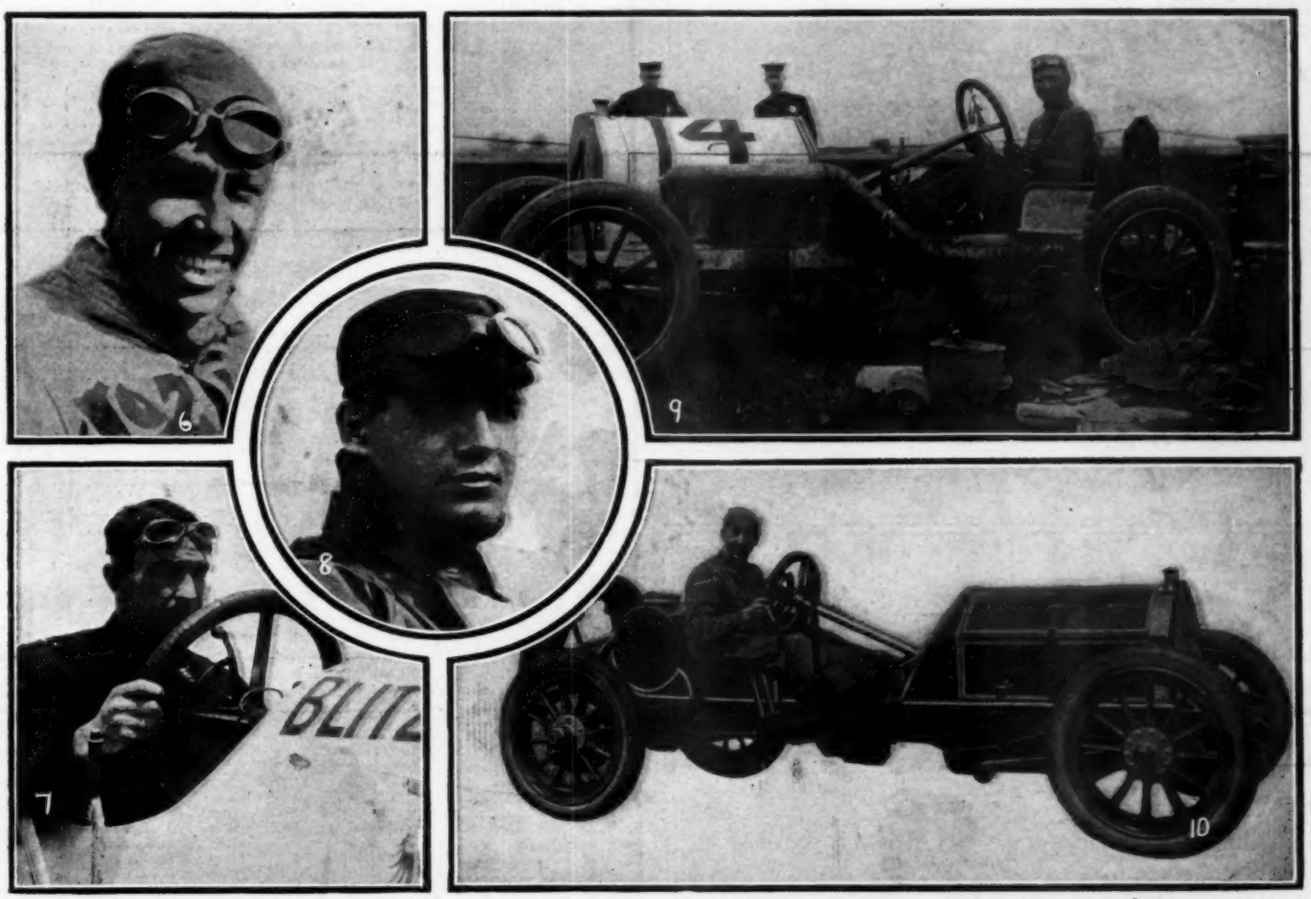
The Fairmount Park race is always much slower than any of the other big events because of the numerous dangerous curves and grades, but in this year's running of the event the course record was broken by a Benz car driven by Erwin Bergdoll. The new mark set is 61.149 miles an hour, almost 13 1-2 miles an hour slower than the record performance of the National at Santa Monica. This race was run in four classes, each being considered a race in itself.

The Elgin national stock car races proved victories for the

These were divided under five heads: Track, hill-climbs, road races, speedway events and beach races. There were 207 races run on circular dirt tracks at various points in the country, but largely centered in the district near New York City.

The tabulation under this head shows that the Simplex won more dirt track races than any other make of automobile. The figures might be somewhat confusing unless it is remembered that Ralph De Palma campaigned a powerful Simplex car most of the past season, winning race after race with it against small fields. This should not detract from the performance of the car, but due weight should be given to the fact that the showing of the Simplex on the dirt tracks was to a considerable extent based upon the work of one car.

The Mercer is second in this table with 20 winning races. Hughes, the factory driver, raced Mercers at track meets with much success, but the high standing of the car in the list is due



6—Ralph Mulford, this year's Vanderbilt winner. 7—Bob Burman, who drove the Benz and Opel to new records. 8—Ralph De Palma, competition champion of the year. 9—J. R. Rainey in the Cino, a winning combination. 10—Hughie Hughes, who drove the Mercer to many victories on track and road.

National in the two large classes and the Mercer and Abbott-Detroit in the smaller divisions.

But the climax of the season was the meeting at Savannah, where four great contests were decided. The winning Fiat, Lozier, Mercer and E-M-F established new marks in their various divisions. The performance of each was of the highest character. The Vanderbilt Cup winner closely approached and the victor in the Grand Prize race went faster than the old Florio record, while the showing of the smaller cars was much better than the existing records, for their classes and the distances run up to the time of the running of the races.

All told during the season of 1911 there were 361 contests decided of a major character. These were all duly sanctioned and officially administered. Of course there were more races run that were important locally and sanctioned, but in the following tabulation only the more important events are considered.

not only to the winning races in which Hughes drove, for Harvey Ringler, of Philadelphia, also contributed several wins to the total. The National and Cino are tied for third place in the standing with 18 victories each. The Cino victories were largely scored around Cincinnati, but Nationals raced all over.

The Benz, Buick, E-M-F, Case, Velie, Abbott, Staver, Inter-State and Opel made creditable showings. The latter was returned winner in five races along toward the close of the season and proved to be one of the speed sensations of the racing season.

One of the saddest angles in track racing is the showing made by a number of heaps of junk that masqueraded under the names of various well-known factories. For instance, a Peerless of 1906 was raced against other cars of current model; a Marmon that had once been a flyer, but which had outlived its usefulness, made a pitiful showing against cars that would have been easy

for it in another day. Numerous other factories that take no interest in racing were pained to learn in the press that old cars bearing their names had finished out of the money and behind cars that would have proved easy for current models.

In hill-climbing there were 71 races run of sufficient importance to tabulate. The National cars won 23 firsts, most of the victories being scored by the factory team, although a few private owners and district agents added to the total. The Ford and Buick tied for second with the Oakland and Knox next in order. As a general proposition the time made over the various hills negotiated was better than it was in 1910.

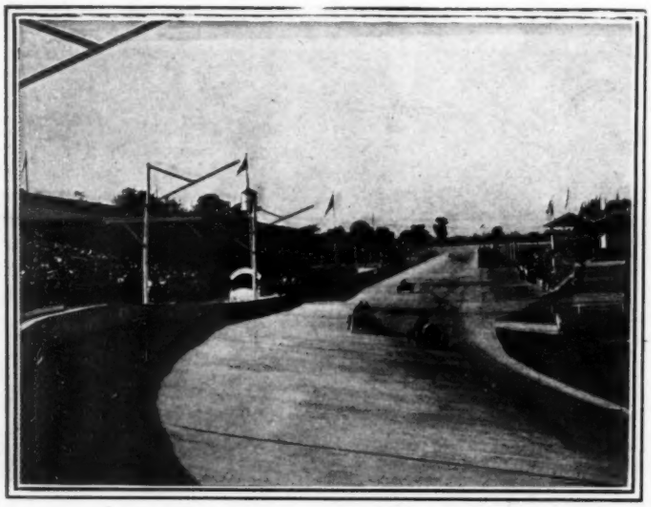
There were 25 road races during the season, counting as races the performances of the various divisions of Classes B and C. The National won eight firsts, Mercer four, Fiat, Lozier and Buick two each and the remainder were divided among seven different makes.

On the speedways the National also led with five victories, but was closely pressed by the Simplex. The performance of the Marmon at Indianapolis was the most notable feat of the year on the speedways, but the Fiat made a wonderful showing in the 24-hour race run at Los Angeles where it turned 1,491 miles. On the beaches the National won 17 times.

Grouping all the contests it is found that the National leads by an overwhelming number of victories, scoring 72 wins during the season. In total number of victories this make stands first in each division except dirt track racing. The nearest competitors of the blue cars were the Mercers and Simplexes, with 30 wins each.

Buick, Ford, Cino, Benz and E-M-F are next in line and then follow the remainder of the 52 makes that took part in the racing of the year to the extent of at least one first.

Characteristic American Racing Scenes



How Indianapolis Speedway looks on a racing day

Ideal hill-climb scene—stock car event at Algonquin

How the Cars Performed

Road Races

Make	1st	2d	3d	Make	1st	2d.	3d
National	8	2	3	Pope	1	4	2
Mercer	4	1	4	Benz	1	1	0
Buick	2	0	0	E-M-F	1	2	2
Lozier	2	0	0	Abbott	1	0	0
Fiat	2	0	1	Cole	1	1	0
Marmon	1	3	2	Ford	1	0	0

Speedway Races

National	5	7	2	Marmon	1	0	1
Simplex	4	2	1	Knox	1	0	1
Lozier	1	1	0	Fiat	1	0	0

Beach Races

National	17	10	7	Ford	2	0	0
Pope	7	9	9	Cadillac	2	0	0
Warren	3	2	0	Lancia	1	1	2
Mercer	3	2	1	Buick	1	2	2
Cole	3	5	4	E-M-F	1	0	0
Benz	2	0	0	Inter-State	1	2	3

Hill Climbs

National	23	10	5	Fiat	2	1	1
Ford	9	6	3	Marmon	1	1	1
Buick	9	10	5	Staver	1	1	0
Oakland	6	3	0	Flanders	1	0	0
Knox	5	8	4	Abbott	1	2	0
Velie	3	2	6	Falcar	1	1	1
Empire	3	3	0	Benz	1	0	0
Corbin	3	0	0	Simplex	1	2	1
Mercer	3	2	2	Paige-Detroit	1	1	2
Pope	2	1	3	S. P. O.	1	0	0
Cino	2	1	0	Everitt	1	0	0
Cole	2	4	1	Stoddard-Dayton	1	0	0
Lion	2	0	0	Reo	1	0	1
Case	2	2	1	Metz	1	1	3
Krit	2	1	0				

Contest Records

Driver	1st	2d	3d	Driver	1st	2d	3d
De Palma	32	4	6	O'Brien	2	0	1
Burman	22	6	0	Maisonville	2	1	7
Wilcox	18	12	3	Aitken	2	3	1
Hughes	15	12	4	Belcher	2	5	2
Raimey	15	4	5	Heitmyer	2	0	0
Zengel	12	1	0	Boersch	2	1	1
Tower	12	3	3	Knipper	2	6	3
Kulick	10	4	2	Farr	2	0	1
Disbrow	9	16	11	Nielsen	2	0	0
Ringler	8	1	0	Bishop	2	1	1
Bauer	6	1	0	Apgar	2	0	0
Jagersburger	6	4	3	Tucker	2	1	0
Merz	6	3	5	Foutz	2	1	1
Herr	5	0	0	Walker	2	1	1
Davis	5	0	0	Menker	2	0	0
Rutherford	5	5	1	Redewell	2	1	0
Nikrent	5	3	5	Robinson	2	0	1
Dingley	4	4	0	Heisey	2	0	4
Bragg	4	1	1	Mulford	2	0	0
Pearce	4	4	1	Hearne	2	4	1
Sutherland	4	1	0	Smith	2	1	1
Herrick	4	0	0	Patschke	2	1	1
Monckmeier	4	8	5	Sheets	2	2	5
M. Roberts	4	5	1	Ireland	2	0	0
Bruce Brown	3	0	0	Radina	2	0	0
Seek	3	1	1	Padula	2	3	0
Peterson	3	0	0	Hoffman	2	0	0
Witt	3	0	0	De Witt	2	0	0
Jenkins	3	3	0	Reeves	2	0	1
Heineman	3	5	3	Clark	2	0	0
Coffey	3	4	2	Wilson	2	3	2
Donnelly	3	6	3	Pieling	1	0	0

There were seven makes of foreign cars in American racing in 1911. These were Benz, Fiat, Opel, Mercedes, S. P. O., Hotchkiss and Lancia. The latter concern was represented by a single old car which failed to gain any appreciable laurels. The first three named raced the best product of their factories and there were two Mercedes cars in American contest work that would rank high anywhere.

Coming down to the drivers, the tabulation shows that Ralph De Palma won 32 events, leading Burman by 10 victories. De Palma drove Simplex, Mercer, Fiat and Mercedes cars, winning mostly on a Simplex driven on dirt tracks.

Burman drove Benz, Opel, Mercedes and Marmon cars, scoring most often with the first named. In Wilcox, Zengel, Merz, Herr and Herrick the National factory was well off for pilots, as shown in the winning tabulation. In Disbrow and Dingley the Pope factory was well represented. The Mercer victories were scored by Hughes and Harvey Ringler. Kulick scored much success and Tower, of the Studebaker team, won many times with the E-M-F and Warren. Howard Bauer, of the Oakland company, had a high percentage of wins in a small number of starts. His performances were mostly hill climbs, at which form of contest he is regarded as being a leader. His specialty, however, is driving in endurance and reliability runs. Raimey, driver of the Cino, made an excellent showing in the winning column.

Bruce-Brown, winner of the Grand Prize, only started a few times during the year, but his work showed that he had forgotten nothing of his knowledge of driving. Harroun only started in one real race, the 500-mile international sweepstakes at Indianapolis, and won it. Mulford also was an infrequent starter, but he won his class in the Fairmount Park race, finishing second to the Bergdoll Benz. He also won the Vanderbilt Cup race.

Frank Witt, who drove the winning E-M-F in the Tiedeman Trophy race, made only a few starts during 1911, and the same may be said for such sterling performers as Belcher, Knipper, Hearne and Bergdoll.

The factory campaign of the National company and the activity of De Palma, Hughes and Raimey in minor events, which count in the totals with the same force as the winning of a big road race, have served to confuse the perspective. On the figures the National is the champion of the year and De Palma is the kingpin driver. Burman is second in the list.

The tendency as shown in 1911 is toward centralization, but on different lines from those suggested by the futile grand circuit fiasco. A speedway near New York is projected and in the Central West is a movement to build a circuit for track racing.

During the Year

Track Events

Make	1st	2d	3d	Make	1st	2d	3d
Simplex	25	4	5	Pope	3	4	3
Mercer	20	11	6	Warren	3	5	3
National	18	16	13	Ohio	2	2	1
Cino	18	9	8	Fiat	2	4	1
Buick	16	9	12	Cutting	2	4	6
Benz	13	8	2	Corbin	2	1	6
E-M-F	13	6	8	Stearns	1	0	0
Ford	11	3	1	Midland	1	2	0
Case	7	8	6	Maxwell	1	1	0
Velie	7	2	2	Jackson	1	7	4
Abbott	5	6	2	Hudson	1	1	0
Staver	5	10	8	S.-P. O.	1	0	2
Inter-State	5	2	1	Hotchkiss	1	0	5
Opel	5	1	0	Correja	1	3	0
Colby	4	1	0	Chalmers	1	1	3
Klinekar	3	6	1	Paige-Detroit	1	5	5
Firestone-Columbus	3	2	1	Marmon	1	7	3
Mercedes	3	7	1	Schacht	1	1	3

General Summary

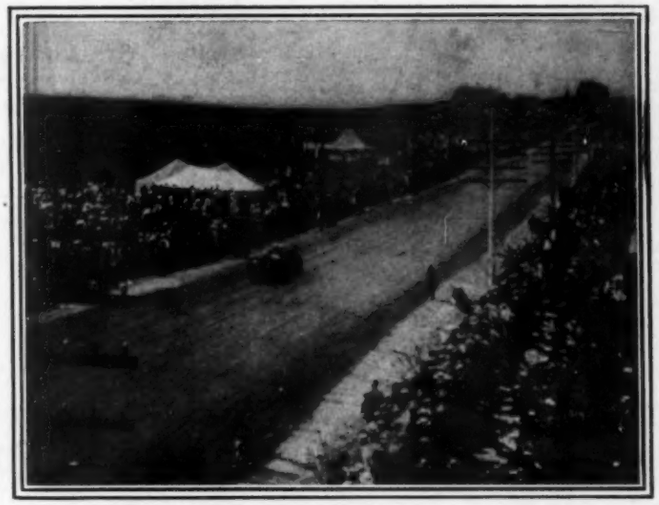
National	72	45	30	Oakland	6	3	0
Mercer	30	16	13	Opel	5	1	0
Simplex	30	8	7	Corbin	5	1	6
Buick	28	21	19	Marmon	4	11	7
Ford	22	9	4	Colby	4	1	0
Cino	20	10	8	Lozier	3	1	0
Benz	17	9	2	Empire	3	3	0
E-M-F	15	8	10	Kline	3	6	1
Pope	13	19	17	Firestone-Columbus	3	2	1
Velie	10	4	10	Mercedes	3	7	2
Case	9	10	7	Ohio	2	2	1
Abbott	7	8	2	Cutting	2	4	6
Fiat	7	5	3	Lion	2	0	0
Staver	6	11	8	Krit	2	1	0
Inter-State	6	4	4	Cadillac	2	1	0
Cole	6	10	5	S. P. O.	2	0	2
Knox	6	8	5	Paige-Detroit	2	6	7
Warren-Detroit	6	7	3				

Cars of seventeen other makes won a single race or contest each, and finished second twenty-one times and third twenty-two times.

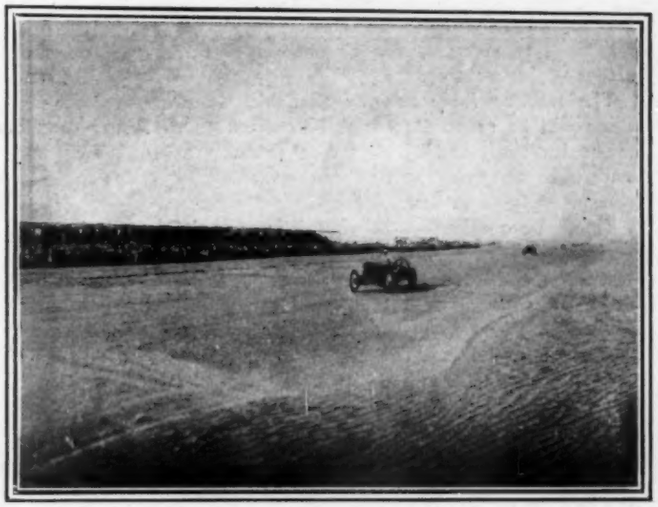
of the Drivers

Driver	1st	2d	3d	Driver	1st	2d	3d
Wiggins	1	0	0	Rouse	1	3	4
Van Wyck	1	0	0	Grinsby	1	2	0
Du Closne	1	1	1	Kilpatrick	1	0	5
Limberg	1	2	0	Oberting	1	0	1
Stone	1	1	0	Meddock	1	3	0
Grennan	1	0	1	Frayer	1	1	0
Richter	1	1	0	Hilliard	1	0	1
Hahn	1	0	0	Harroun	1	0	0
Falk	1	0	0	Sandell	1	0	0
Welch	1	0	0	Habich	1	3	1
Darling	1	0	0	Keene	1	0	0
Meader	1	1	0	Wehr	1	0	0
Wallace	1	1	2	Lawson	1	1	0
Purdy	1	0	0	Maxwell	1	0	0
Forster	1	2	0	Bergdoll	1	0	0
Lame	1	0	0	Parker	1	1	0
McLean	1	0	0	Morton	1	5	2
Dawson	1	0	0	Regan	1	0	0
McMillan	1	0	0	Fickebacher	1	0	0
Lanahan	1	0	0	Steinbrugge	1	0	0
Gruener	1	1	0	Schillo	1	0	0
Cooney	1	0	1	Burt	1	0	1
Anderson	1	2	1	Burke	1	2	0
Stickney	1	1	4	Gray	1	1	2
Morris	1	0	0	Koopman	1	2	0
Hotchkiss	1	0	0	Whelan	1	0	2
Craig	1	5	5	Haupt	1	5	1
Hooker	1	0	1	Tremaine	1	0	0
Pennebaker	1	0	0	Cooper	1	2	0
Fritsch	1	0	0	Evans	1	5	0
Tetzlaff	1	0	0				

Characteristic American Racing Scenes



The Elgin course during the National Stock Car Championships



Galveston's beach racing course during the spring meet

The Long-Stroke Motor for Cars

Part II

By Professor W. D. Ennis

The Engineering Problems of the Long-Stroke Motor Are Discussed in Both Theoretical and Applied Form—Tractive Force is the Real Criterion of a Motor's Value—The Longer the Motor Stroke the Slower the Crankshaft Speed and the More Durable the Engine—Motor Weight Per Horsepower Capacity Is Reduced—Greater Economy in Fuel Is Obtained—More Room for Accessories in the Long-Stroke Motor.

In a previous installment of this paper, which appeared in The Automobile for November, the writer discussed some of the more evident and obvious factors which should be considered in fixing the ratio of stroke to bore in automobile motors. The present article deals specifically and quantitatively with these and some other more fundamental, if less apparent, factors. The tractive or pulling force exerted by a four-cycle gasoline motor cylinder is compiled from the established formula

$$F = \frac{pd^2sr}{2Nw}, \qquad (I)$$

in which

F = tractive force in pounds per cylinder, at the cylinder;
d = diameter of piston, in inches;
s = stroke of piston, in inches;
r = revolutions per minute of crankshaft;
N = revolutions per minute of road wheel;
w = diameter of road wheel in inches;
p = average pressure continuously maintained in the cylinder: say about 17 for an ordinary cylinder well operated, single-acting.

The tractive force actually available for propelling the machine will be reduced from this by from 15 to 25 per cent. at the motor shaft and by a further, probably approximately constant, amount at the rim of the wheel.

Since the quotient $\frac{r}{N}$ is what is commonly described as the *gear ratio*, the tractive force for a given car varies directly with the gear ratio. Now, the quantity d^2s may be written as $D \div 0.7854$, where D is the cubical displacement of the piston per stroke, for $0.7854\ d^2$ is the cross-sectional area of the piston and $0.7854\ d^2s = D$ is its displacement. Equation I then becomes

$$F = \frac{pDr}{0.7854 \times 2 \times N \times w},$$

and if we take $p = 17$, $\frac{r}{N} = g$, this gives

$$F = \frac{17\,Dg}{0.7854 \times 2 \times w} = \frac{10.82\,Dg}{w}. \qquad (IIa)$$

A 4 x 5-inch cylinder would have a displacement $D = 0.7854 \times 4 \times 4 \times 5$; its tractive force at a 10-to-1 gear would then be

$$\frac{10.82 \times 0.7854 \times 4 \times 4 \times 5 \times 10}{32} = 213 \text{ pounds},$$

if its wheels were 32-inch diameter.

Then the pulling forces, which can be theoretically exerted by *four-cylinder* motors under the assumed conditions, will be as shown in the chart, it being understood that the reductions previously referred to must be made if the results are to correspond with those of practice.

Terms for Tractive Force

Since s is the stroke in inches, $\frac{25}{12} = \frac{s}{6}$ is the distance in feet traveled by the piston in one revolution, and $\frac{rs}{6}$, which we may call S, is the piston speed calculated in feet per minute. Then,

$$F = \frac{3\,pd^2S}{Nw}. \qquad (II)$$

Also, the circumference of the road wheel is equal, ignoring slipping of tires on road, to the distance traveled by the car in one revolution, and this is $\frac{\pi w}{12}$. In 1 minute the car will move $\frac{\pi wN}{12}$ feet, or in 1 hour it will travel

$$\frac{\pi wN \times 60}{12 \times 5280} = \frac{wN}{336} \text{ miles},$$

which speed we may call V_o.

Then $$V_o = \frac{wN}{336}$$

and

$$F = \frac{pd^2S}{112\,V_o} = \frac{pd^2sr}{672\,V_o}. \qquad (III)$$

$$\text{For } p = 17,\ F = \frac{d^2S}{6.6\,V_o} = \frac{d^2sr}{39.5\,V_o},$$

and if S be taken at 1,000,

$$F = \frac{151.5\,d^2}{V_o}. \qquad (IV)$$

This last expression is less general than any of the preceding, but is the simplest form possible, the ideal tractive force being a function of the cylinder diameter and car speed only.

TABLE OF THEORETICAL TRACTIVE FORCES.

Speed of Car, Miles per Hour.	Tractive Forces Per Cylinder, in Pounds, for Cylinder Diameters Stated.								
	4-in.	4¼-in.	4½-in.	4¾-in.	5-in.	5¼-in.	5½-in.	5¾-in.	6-in.
5	484	549	611	684	758	836	918	1000	1192
10	242	274	306	342	379	418	459	500	596
15	161	182	205	228	252	278	305	333	364
20	121	137	153	171	189	209	230	250	292
25	97	110	122	137	152	167	183	200	218
30	81	91	102	114	126	139	153	167	182
35	69	78	88	98	108	119	131	143	156
40	60	68	76	86	94	105	115	125	146
45	54	61	68	76	84	93	102	111	121
50	48	55	61	68	76	83	91	100	109
55	44	50	56	62	69	76	83	91	99
60	40	45	51	57	63	70	76	83	91

Equation IV holds only for a piston speed of 1,000 feet per minute, a figure roughly standardized as a basis for rating. The power of any engine may vary directly with its piston speed; the faster it runs, the more work it can do. The tractive *force* is, however, independent of the piston speed. This is true of both internal combustion and vapor engines. In the former, if the gear ratio be kept constant, a change in piston speed is absolutely without influence on the tractive force. See Equation I.

To show this most clearly, we write Equation I in the new form,

$$F = \frac{pd^2sg}{2w}, \qquad (V)$$

in which $G = \frac{r}{N}$ = the gear ratio as commonly defined.

Then an ordinary four-cycle motor at 3 to 1 rear axle gear, with 34-inch wheels on the car, should give for each 4½ by 4½-inch cylinder a pulling force of

$$\frac{17 \times 4\frac{1}{2} \times 4\frac{1}{2} \times 4\frac{1}{2} \times 3}{2 \times 34} = 68.3 \text{ pounds.}$$

Generally speaking, if we regard p as constant at 17 pounds, then for a given car at a given gear, g and w being fixed, the tractive force varies with d^2s; for the car considered, it is

$$\frac{17\, d^2s \times 3}{2 \times 34} = \frac{51}{68} d^2s.$$

Without gears an internal combustion cylinder could exert only one constant tractive force—the steam engine may cotinuously adjust its tractive force to the load by changing the point of cut-off and thus varying p. No great variation in mean internal cylinder pressure is possible or desirable in the internal combustion engine. The gears must be depended upon to vary the tractive force when necessary.

Since F is proportional to d^2s, it might appear that there is no special reason for increasing s in order to attain high tractive forces. But we must go into the matter more searchingly.

Piston Speed and Rotative Speed

In comparatively recent steam engine practice, a piston speed of 600 feet per minute was considered normal, and anything above this excessive; yet to-day in both steam and stationary gas engine design speeds up to 1,000 and even 1,200 feet per minute are common, and no serious disadvantages have accompanied these increased speeds. They have been attained, at least in steam engine work, *by increasing strokes* while leaving rotative speeds, revolutions per minute, as they were formerly. When the stroke of a releasing gear engine was limited to 48 inches, a piston speed of 800 feet was about the limit, because the releasing type of valve gear does not work well at rotative speeds exceeding 100 revolutions per minute. With a 5-foot stroke, the same type of valve gear permits of a 1,000-foot piston speed; and this with only minor difficulties, if any, with rod packings and guide and cylinder lubrication. It is the *rotative speed* that limits the performance of any engine, the revolutions per minute.

This is for two reasons: First, because certain types of valve gear, particularly those involving automatic features, do not work satisfactorily above certain speeds. In the internal combustion engine the use of positively actuated valves of the lift type, with suitably stiff springs, has placed this limit at least as high as 1,500 revolutions per minute, a limit far above any ever regarded possible in power plant engines, and probably never to be desirable for such service. Second, because a reciprocating engine wears out by reason of the shocks to which it is subjected. Every revolution includes two serious shocks, each comprising a total reversal of the direction of piston movement. The life of the engine may be expressed, other things being equal, in the total number of reversals it can stand. The more frequently these reversals are made, the shorter the life. High rotative

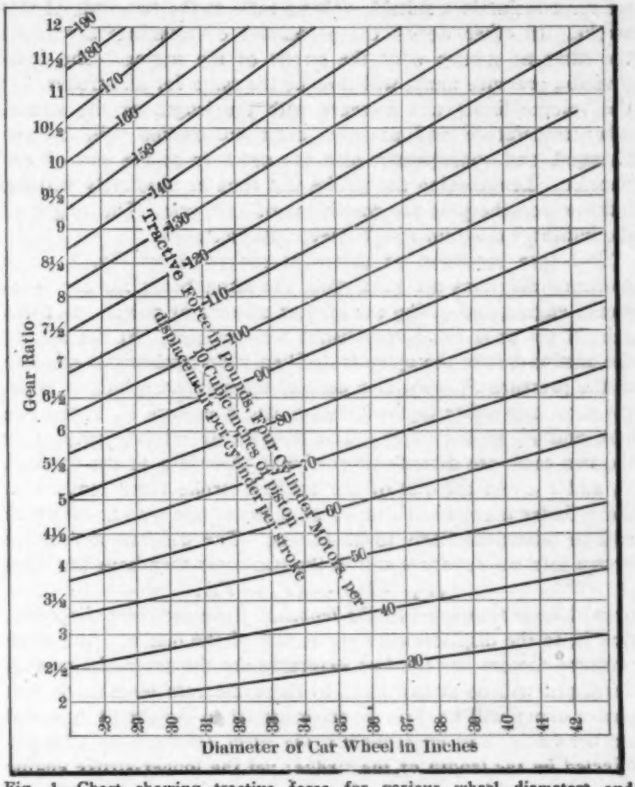

Gear Ratio
Diameter of Car Wheel in Inches
Tractive Force in Pounds. Four Cylinder Motors per 10 Cubic Inches of Piston Displacement per Cylinder per Stroke

Fig. 1—Chart showing tractive force for various wheel diameters and gear ratios

speeds, therefore, implies durability, increase repair expense and decrease the useful life of the machine. The piston speed is a relatively minor matter. If high piston speed can be attained without high rotative speed, only minor difficulties will be encountered.

The Long Stroke

To accomplish this end, the long stroke may be employed. For a given piston speed and horsepower the longer the stroke the lower will be the rotative speed and the more durable the engine. For a given number of revolutions per minute and gear, the longer the stroke the greater will be the piston speed, tractive force and horsepower. Design limits the revolutions per minute and running conditions determine the gear. The long stroke then gives maximum pulling force, power and speed. It may add slightly to the initial cost of the motor and may require special design in the arrangement of parts, but these disadvantages, if they are disadvantages, are trifling.

Efficiency of Long-Stroke Motors

The question is also worth considering from the standpoint of fuel economy. It is sometimes claimed, and the claim seems at first sight reasonable, that a long stroke gives opportunity for more complete expansion, and this improves the cycle of operations. The case is put as in Fig. 2. If 1234 represents the indicator diagram of the ordinary engine, increasing the stroke is thought to give the additional power 4561 at no increased expenditure for fuel. But it should be remembered that the pressure at the end of the suction stroke 71 is principally a matter of valve port friction, and is not much affected by the length of the stroke, so that compression in the long-stroke engine begins at 8 and its indicator diagram is 890*h*, as compared with 1234 for the ordinary motor. This diagram may still seem to give more work.

Let us carry the analysis a little further: Let the pressure at the beginning of compression be fixed. The law of the compression curve is probably not much influenced by the length of the stroke, so that to obtain the pressure and temperature prescribed by the nature of the fuel at the end of the compression stroke

we must maintain a suitable volume ratio at the two ends of this stroke. In other words, the percentage of clearance should be the same no matter what the stroke of the engine. The compression pressure limits will then be the same for all strokes, but the volume limits will increase with the length of the stroke. The temperature and pressure after combustion will be unchanged, and consequently also the pressure at the end of expansion. Lengthening the stroke will thus be absolutely without influence on the pressure conditions of the cycle. The length of the indicator diagram will, however, be increased.

This true condition of things is suggested by Fig. 3. The indicator diagrams are 1234, 5678, the latter being for the long-stroke engine, and giving the greater amount of power. But this gain in power is not accomplished without cost. At the end of the suction stroke the cylinder is filled with combustible mixture at the pressure $P_1 = P_5$, at a definite temperature which is about the same for either type of engine, and a volume V_1 in the one case and V_5 in the other. The *weights* of mixture present in the two cases are directly proportional, therefore, to the volumes V_1 and V_5. At the end of the exhaust stroke there remains in the cylinder a volume V_2 or V_6 of mixture, the weight of which will be related similarly to its volume. The weights of mixture *drawn into the cylinders* will in the two cases then have the ratio

$$(V_1 - V_2) \div (V_5 - V_6),$$

or will be *proportional to the lengths of the indicator diagrams*, that is, to the displacements per stroke of the piston. And since pressure factors for the two diagrams are the same, the powers developed will be proportional to these diagram lengths, so that power ouput will be directly proportional to weight of fuel and air drawn in, and consequently *the ideal efficiency will be unaffected by the length of the stroke;* yet the longer-stroke engine may have certain practical advantages on the ground of reduced piston leakage.

Clearance in the Motor

In a steam engine clearance causes loss, and the effort is made to minimize it. In the internal combustion engine large clearance is necessary in order to obtain the pressure condition essential at the end of compression. While steam engine clearances vary from 3 to 8 per cent or more in small engines, and great refinement in valve design is practiced in order to reduce it, gasoline engine clearances may range from 20 to 40 per cent., and may as easily be too low as too high. In the steam engine the *amount* of clearance (linear) is practically fixed by the workmanship and the type of valve gear, and the *proportion* of clearance (in relation to piston displacement) is consequently reduced by using a long stroke, that is, a high piston displacement per stroke for a given cylinder area. No such argument holds in the automobile motor. It is true that short-stroke motors need less linear clearance than those of long stroke, but there are no designing difficulties in reducing linear clearance far below the permissible standard for internal combustion motors.

Some Practical Considerations

There are now to be considered some factors which, though permitting of less exact analysis, must be regarded in any final estimate. Among the incidental advantages claimed for the long stroke there are:

1. Reduced maximum pressures on parts.
2. Less motor weight per horsepower of capacity.
3. Longer life of motor.
4. Reduced wall area of compression space.
5. Greater economy in fuel.
6. More room for valves and better intake and sparking arrangements.

These we will now investigate.

1—Maximum Pressures

Assuming that the percentage of clearance is the same in both types of motor, then in Fig. 3.

$$P_2 = P_6.$$

If combustion is equally effective in both types,

$$P_3 = P_7 \text{ also.}$$

These latter pressures are the maximum *specific* pressures in pounds per square inch in the cylinder. The total pressure between piston and cylinder head at or near the end of the stroke is then

$$\frac{\pi}{4} d^2 P,$$

d being the diameter of the cylinder in inches and

$$P = P_3 = P_7.$$

At fixed piston speed and a given gear the horsepower of a motor is proportional to the square of the cylinder diameter. At a fixed rotative speed (the true determining condition) horsepower is proportional to d^2s, the square of the diameter multiplied by the stroke. An engine must be designed for a required tractive force and horsepower, so that the value of d^2s may be said to be fixed by the conditions. Suppose this value to be 125: so that if $d = 5$, $s = 5$; if $d = 4$, $s = 7.8$; if $d = 3$, $s = 13.9$, etc. The motors, 5 x 5, 4 x 7.8 and 3 x 13.9 inches respectively, will at uniform revolutions per minute all give the same power, but the maximum pressures for uniform values of P will vary as the squares of the diameters, or will be in the ratios $5^2 = 25$, $4^2 = 16$, $3^2 = 9$, being about three times as much for the 5-inch cylinder as for the 3-inch.

This enormous difference in pressures is directly related to

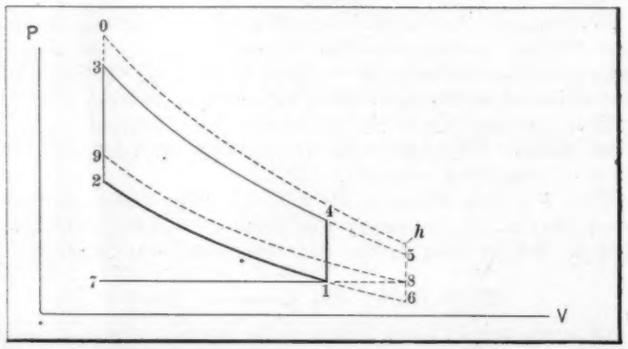


Fig. 2—Theoretical diagram showing the apparent increase in work by use of the long stroke

maximum stresses on cylinder head, piston pin, crank pin and shaft, and controls the design of those parts. Furthermore, the higher pressures cause more lost work in friction, and thus reduce the output of useful work from the engine.

2—Motor Weight

The wall area of the cylinder is made up of that of the head, $\frac{\pi}{4} d^2$, and that of the barrel, which we may call $\pi d s$. If differences in wall thickness be ignored the total wall area, volume of metal and weight of the cylinder will be proportional to $\frac{\pi}{4} d^2 + \pi d s$. This quantity increases less rapidly than the horsepower (a function of d^2s at constant revolutions per minute) as the diameter is increased, so that at first sight it would seem as if large diameters and short strokes were favorable to light weight per horsepower.

But the stress on the metal in the barrel of the cylinder is proportional to its diameter, and the wall thickness must be increased in the same ratio as the diameter, even though the specific pressure inside remains constant. We may, therefore, regard this part of the wall as varying in weight directly as $\pi d s \times d = \pi d^2 s$. The cylinder head may be regarded as a sort of compound beam supported at its rim and uniformly loaded. The breaking stress varies as the length of the beam, that is, as the

diameter of the head, so that the weight of metal in the head is proportional to

$$\frac{\pi}{4} d^2 \times d = \frac{\pi}{4} d^3,$$

and the whole weight of metal in barrel and head varies as

$$\frac{\pi}{4} d^3 + \pi s d^2,$$

a quantity which for usual values increases more rapidly with d than does the horsepower. The long stroke may, therefore, reduce weight of motor per horsepower of capacity.

For example, compare a 4 by 4 motor with one 4 by 6. The horsepower capacities bear the ratio

$$\frac{4 \times 4 \times 4}{4 \times 4 \times 6} = 2/3 = 0.667.$$

The head areas are each $0.7854 \times 4 \times 4 = 12.6$ square inches. The wall areas are, short stroke, $3.1416 \times 4 \times 4 = 50.4$ square inches; long stroke, $3.1416 \times 4 \times 6 = 75.53$ square inches. The total areas are $50.6 + 12.6 = 63.2$ and $75.53 + 12.6 = 88.13$ square inches, respectively. The ratio of these figures is

$$\frac{63.2}{88.13} = 0.716.$$

Suppose the first motor to weigh 200 pounds and its output to

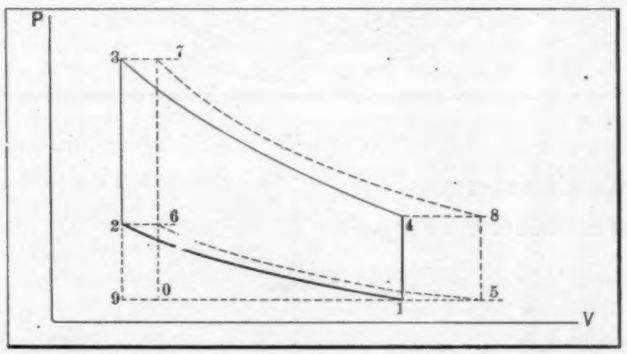


Fig. 3—The true gain in work is not so great as the apparent gain, as here shown

be 35 horsepower; then the second will weigh $0.716 \times 200 = 143.2$ pounds, and its horsepower will be $35 \times 2/3 = 23.3$. Its weight per horsepower is $143.2 \div 23.3 = 6.11$ pounds, while that of the long-stroke motor is $200 \div 35 = 5.71$ pounds. If the 35 horsepower had been obtained by increasing the number of cylinders of the short-stroke motor the required weight would have been $35 \times 6.11 = 214$ pounds, or 14 pounds greater than that of the long-stroke motor.

3, 5—Longer Life and Greater Economy

The former of these factors has been discussed under *piston speed and rotative speed*, the latter under *stroke and ideal diagram* and *clearance*. Some additional considerations as to the latter may be suggested by the paragraphs on *maximum pressures*. A considerably longer life may be expected from the long-stroke motor; any direct increase in thermal efficiency due to its use seems likely to be small.

4—Reduced Wall Area of Compression Space

If a be the proportion of clearance, the length of the clearance or compression space is $a\,s$ and its side wall surface is $\pi\,d\,a\,s$. Adding the head surface, $\frac{\pi}{4} d^2$, we have $\pi\,d\,a\,s + \frac{\pi}{4} d^2$ as the total surface exposed to radiation at the end of the stroke. This varies more rapidly than the horsepower, as the diameter is increased, so that long-stroke motors have proportionately less wall area in the compression space than those of short stroke.

Consider a 4 by 4-inch and a 3¼ by 6-inch motor, both giving the same horsepower. If 30 per cent. of clearance is needed the linear clearance of the first motor may be taken as 1.2 inch, and its clearance wall surface is $(3.1416 \times 1.2 \times 4) + (0.7854 \times 4 \times 4) = 15 + 12.6 = 27.6$ square inches. That of the 6-inch-stroke motor (with 1.8 inch of linear clearance) is $(3.1416 \times 3¼ \times 1.8) + (0.7854 \times 3¼ \times 3¼) = 18.3 + 8.3 = 26.6$ square inches, the slight advantage being in favor of the second motor.

It is difficult to see any vital importance in this peculiarity (at least in connection with automobile motors). Possibly the maximum pressure, $P_3 = P_1$, Fig. 2, might be increased slightly by a reduction of wall area, with consequent good results as to thermal efficiency, and, of course, some loss of any proposed advantages in respect to maximum pressures and motor weights; but the cylinder walls must be cooled anyway, and at high piston speeds with comparatively small cylinders it is doubtful whether any difference in maximum pressures or shape of expansion curves could be traced to a difference in wall area of compression space.

6—Room for Accessories

The necessarily longer clearance space does, nevertheless, affect in an important way the arrangements for admitting, igniting and exhausting the combustible mixture. The area of the head being $\frac{\pi}{4} d^2$ and that of the side walls of the compression space $\pi\,d\,a\,s$, while the prescribed volume of clearance space is $\frac{\pi}{4} d^2\,a\,s$, we find that the space on the head varies as the clearance volume (and consequently at fixed revolutions per minute and clearance ratio, as the horsepower), while the available space on the side walls varies less rapidly. With long strokes and small diameters side wall space is more available for accessory attachments.

Summary of Facts

The long-stroke motor seems to have fully justified its existence. Some of the arguments advanced in its favor may fall to the ground under close examination; it is a mechanical rather than a thermal device, and its advantages are mechanical rather than those related to thermal efficiency. In steam-engine practice equality of bore and stroke is a feature only of high (rotative) speed engines. With piston speeds pretty well standardized, the higher the rotative speed the shorter the stroke, and the lower piston speeds, shorter strokes and higher rotative speeds have all been necessarily associated with the smaller engines. This condition of things probably influenced early standards in the design of internal combustion motors. There is no sufficient reason why it should continue to do so. It was a wrong condition, and steam-engine builders are now resorting to higher piston speeds, particularly in large units. Large gas engines have led the way by demonstrating the feasibility of piston speeds exceeding 1000 feet per minute. With the high-duty requirements of the automobile motor it is reasonable to go still further, and if 1000 revolutions per minute has been found satisfactory for a 4-inch stroke, giving 1000 feet piston speed, the same rotative speed with a 6 or 7-inch stroke, giving 1500 to 1750 feet piston speed and an increase of 50 to 75 per cent. in power with the same diameter of cylinder, is justifiable.

Cleaning Rusty Parts—It has been discovered by accident that a rusty part which could not easily be cleaned by pickling in an acid bath can be disposed of quickly by first immersing it in a strong alkaline bath, which also serves to remove whatever grease may adhere to it. A strong solution of soda or caustic potash is heated and the part is left one-half hour therein. Then a solution of one part of hydrochloric (muriatic) acid to four parts of water will remove the rust. Thereafter the part is rinsed in a weak solution of carbonate of soda and brushed with water and pumice. The rinsing is necessary only if the part must be used at once. Otherwise it is simply wiped dry.—From *Cycle et Automobile Industriels.*

Digest of the Leading Foreign Papers

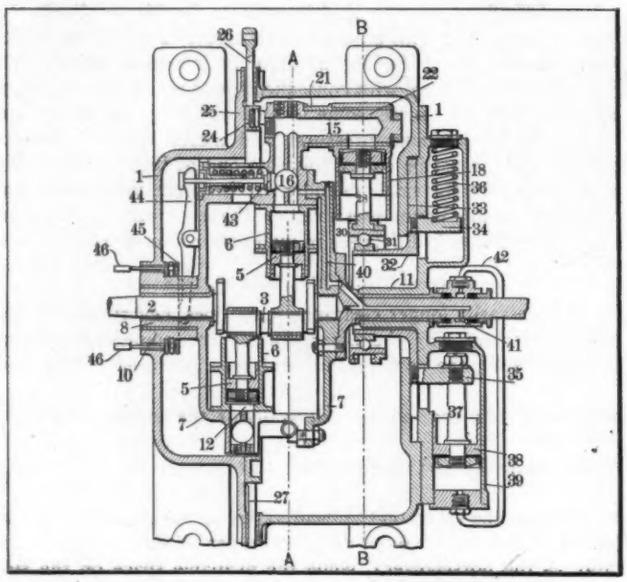


Fig. 1.—The Louis Renault hydraulic transmission

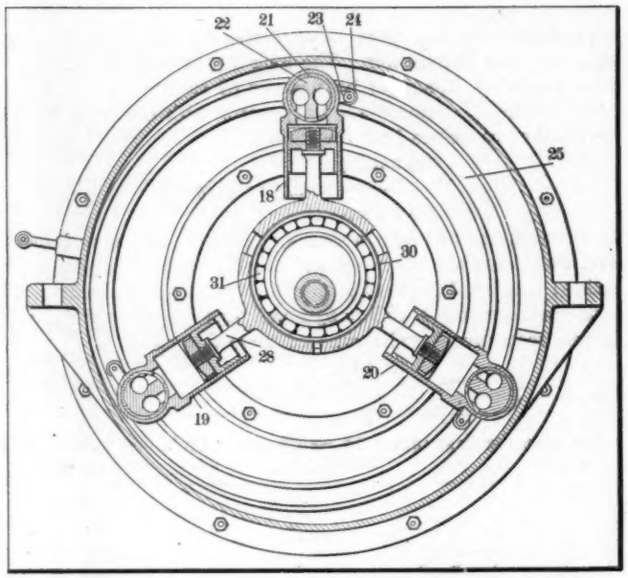


Fig. 2—Mounting of driven pumps—Section B B in Fig. 1

Hydraulic Transmissions—II
Renault and Hele-Shaw Types

THE author describes and illustrates a series of mechanisms in which the functions of an infinitely graduated clutch, permitting the starting of a vehicle—a heavily loaded truck for example—at a highly reduced speed, are supposed to be combined with those of a change-gear mechanism, by which the power applied to the driving wheels is increased in proportion as their speed is reduced. In a preliminary discussion of the subject it was argued that in most hydraulic transmissions the designers are deluding themselves with regard to the power obtained at low vehicle speed. The reduced speed of the drivenshaft is generally obtained by a graduated slip in the action of the oil against the driven parts, which slip, however valuable for clutch and starting action, creates friction in the oil conduits and is consequently transformed into heat, but is not delivered to the drivenshaft in the form of power. In one part of the series, the Williams-Janney hydraulic transmission, in which this defect is to a great extent avoided, was described in THE AUTOMOBILE of November 2, and this construction, which has been adopted by the Delaunay-Belleville company of France, is a modern adaptation from the American Cooper-Hampton patent of 1894. Among other constructions described those designed by Louis Renault of France and Professor Hele-Shaw of England, are notable by reason of the prominence of the designers and the fact that in both a direct drive at the adjustment corresponding to high gear in a mechanical transmission is obtained by locking the driving and the driven parts together by immobilizing the oil between them. In neither case, however, does the author seem to consider that the power efficiency at low vehicle speed has been established.

By carefully following the reference numerals on Fig. 1, while realizing that each of the three driving pumps in this relatively complicated mechanism has a corresponding driven pump and that the oil piping connecting them is partly transverse of the mechanism and partly circumferential, the reader may arrive at an understanding of the Renault hydraulic change-gear and transmission, the patent for which dates back to 1906.

In a general way the mode of operation is as follows: When the pistons 5 of the three driving pumps are prevented from moving because the passages are closed which connect the oil in them with the circulation, the rotation of the motor shaft 2 effects, instead, the rotation of the inner casing 7, to which the driven shaft 9 is secured, and the latter is therefore rotated as in direct drive. If the passages are open which permit oil discharged from the driving pumps to go freely into the circulation without passing through the driven pumps, the transmission is in neutral. If these passages, valves 43 in the drawing, to the circulation (the mass of enclosed oil) are closed, the driven oil exerts a pressure upon the pistons of the driven pumps, but these are mounted upon a ball-bearing which is normally concentric with the axis of rotation of the mechanism and cannot reciprocate; in other words, the driven pumps cannot discharge oil and the drive is therefore still direct. It is, however, only a strong spring, 36, which holds the inner ends of the driven pistons in their inoperative position of concentricity. Suppose the throttle of the motor is opened wide while the load is much increased, the pressure on the driven pistons is then much increased and may be sufficient to overcome the spring resistance referred to. To this end passages communicate the pressure to a separate adjustment piston, 37, working in a separate cylinder, by the movement of which against the spring's resistance the sleeve is displaced more or less from the concentric position. The greater the surplus pressure over and above that of the spring, the greater the displacement and the resulting eccentricity. Now, the driven pistons are enabled to reciprocate, the valve mechanism being of course such as to coordinate their movements with those of the driving pistons and with reference to the masses of oil displaced in each system of pumps, the driving and the driven. If the driven pistons are adjusted so as to discharge only a small portion of the oil which the driving pumps could deliver if they were free to move, the action of the driving pumps will be correspondingly reduced (as on direct drive it is reduced to nothing) and the balance of the

available energy in the motorshaft will be expended in turning the inner casing 7, and the drivenshaft secured thereto; the speed of the drivenshaft being reduced as compared with that of the motorshaft in proportion as more or less oil is permitted to escape through the driven pumps.

When high pressure in the whole system of passages causes the ball-bearing sleeve which determines the possible movements of the driven pistons to take a strongly eccentric position, the rotation of the casing 7 and of the drivenshaft is of course reduced to a minimum, and it seems to be the designer's idea that for this reason the mechanism accomplishes the same that is accomplished on the low gear of a mechanical transmission. The author, on the other hand, considers that the designer has produced only a clutch, with graduated slippage.

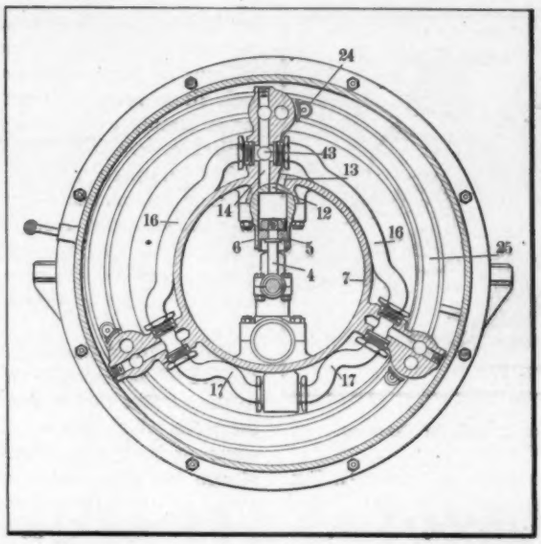


Fig. 3.—Transverse section of Louis Renault hydraulic transmission, on line AA in Fig. 1

The detail of operation of this hydraulic set follows: The motor shaft 2 controls the three pistons 5 which move in pump cylinders 6 pivotally secured to a drum 7, to which is secured in turn the driven shaft 9. The pumps communicate with the fluid in the drum and casing through the passages 12, which alternately register with the admission channel 13 and the discharge pipes 14, and they communicate mutually as well as with three largerdriven pumps 18, 19 and 20, Fig. 2, by the passages 15 shown in Fig. 1 and 16 and 17, shown in Fig. 3. The fluid feed of the driven pumps is regulated through the cylindrical distributers 21 around which the pumps oscillate and which themselves oscillate on the shafts 22 with a movement controlled from the crankarms 23, which moves on rollers 24 in the circular path 25, and whose eccentricity with relation to shafts 2 and 9 is regulated by the rods 26 and 27.

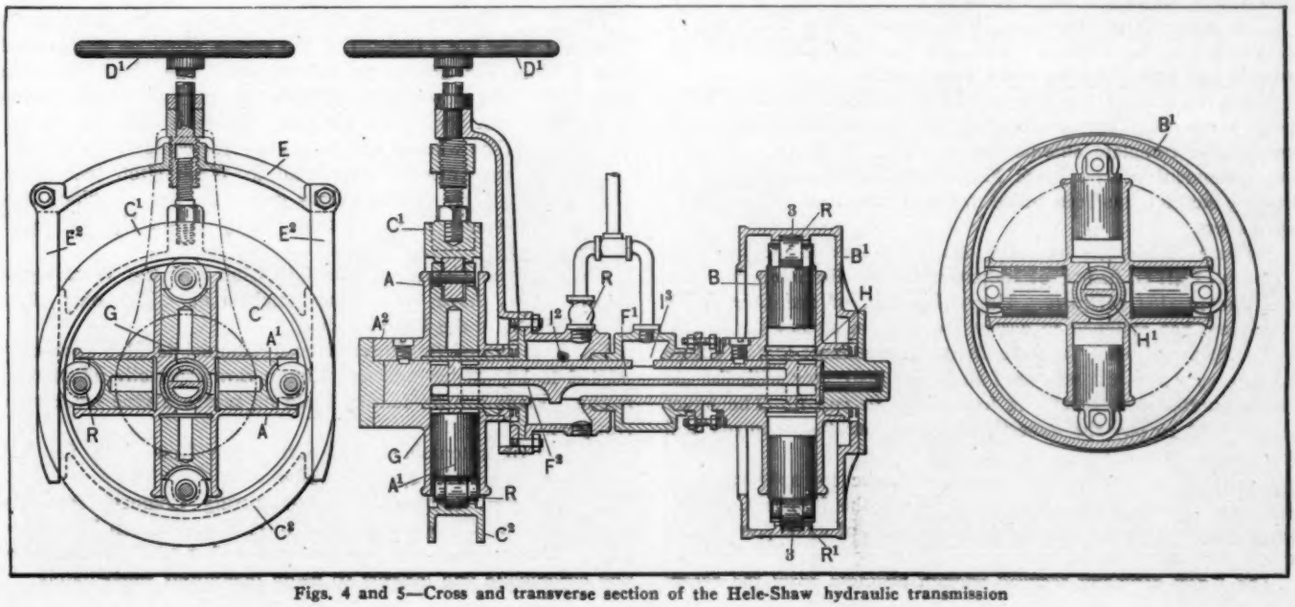
The piston rods 28 of the driven pumps are fixed upon the outer race 30, of ball bearing 31, mounted upon the sleeve 32, which forms the integral cylindrical hub flange of plate 33, which may be placed in a more or less eccentric relation to the axis of the mechanism, being controlled in this respect at 34 and 35 through the spring 36 and the piston 38, the latter moving in a cylinder 39, which communicates with the two systems of pumps by channels 42, 41, 40 and 16.

Normally spring 36 maintains 32 concentric with driven shaft 9 and, in this adjustment, if the valve 43 is opened by means of the control device 46, 45 and 44, so as to place the pipes 16 in direct connection with casing 1—full of oil—and with drum 7, the three pumps 6, turned by shaft 2, will draw oil therefrom and will discharge it into 15, 16 and 17 without the fluid exerting any notable pressure on the pistons of the driven pumps. If 43 is closed, this pressure is increased but without displacing the pistons of these pumps, because the cylindrical flange 32 is concentric with shafts 2-9; and the drum 7 and shaft 9 are drawn along together at the speed of the motor shaft 2.

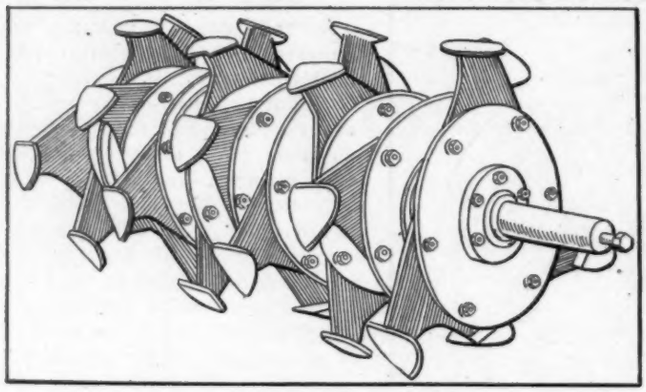
If the pressure in the oil circulation is increased beyond the limit determined by spring 36, piston 38 is moved and displaces plate 33, with its flanged hub 32, eccentrically, so that the pumps 18, 19 and 20 begin to discharge oil proportionately to the eccentricity. The speed of shaft 9 is hereby automatically reduced in proportion to any increase in the resistance against its rotation.

To reverse the vehicle movement, it is sufficient to apply the control levers 36 and 37, which act on the locking device 25 by which the eccentric adjustment of the driving pumps may be changed about, causing the periods of oil intake and oil discharge in the driven pumps to be reversed with relation to those of the driving pumps 6. Shaft 9 will then turn in the opposite direction to that of the motorshaft and with less speed.

In the Hele-Shaw hydraulic transmission, Fig. 4, the system of driving cylinders A and the system of driven cylinders B are both secured upon the shaft F. The pistons of cylinders A impinge by rollers upon a circular track in two parts, C1 and C2, the latter integral with or secured to the control system E and E2, which may be operated by means of the handwheel D1 so as to separate the two parts of the track, thereby varying its shape from circular to oval. The rollers R1 of the driven cylinders B travel on an elliptic path B1, Fig. 5, which is not subject to variation. The intake and discharge of oil from cylin-



Figs. 4 and 5—Cross and transverse section of the Hele-Shaw hydraulic transmission



Combined rotary plough and harrow tool, made in Germany

ders A and B are regulated by the circular valve disks G, Fig. 4, and H1, Fig. 5, which are secured respectively to shaft F and to B1. If the track C1-C2 is maintained strictly circular, the motor shaft A2 rotates the whole system, A, F. B, and B1, as a unit, the immobility of the pistons A1 in their cylinders preventing the pistons of the B system from budging in theirs, and causing the B system to take along the oval track B1 and the driven shaft which is secured to it, as if these parts were integral with the motor shaft and the system of driving cylinders. The pistons of the B cylinders will, on the other hand, be free to move in proportion as the parts C1 and C2 are separated (ovalizing the track for the rollers of A), and if their movement is sufficient to cause the cylinders B to accommodate their positions to the ellipticity of the track B1, at the speed of the motor shaft's rotation, B1 will remain stationary. This is the result when the C track is adjusted to be as oblong as the B1 track always is. At a further lengthening of the C oval, the reverse should be effected. On the other hand, the nearer the C track remains to the circular shape, the smaller is the angular velocity of B1, but it seems questionable if the force which compels B1 to rotate under these circumstances is efficiently applied or is mainly to be looked upon as wasted in slip between the rollers of cylinders B and the track B1.

The return channel for the fluid, through the interior of shaft F, is in communication, at I3, with an oil reservoir from whose oil reserve losses from leakage are made good; and the pressure-channel F2 communicates, at I2, with a valve R which limits the pressure in the mechanism.—From serial article by Ch. Faroux, in *La Vie Automobile*.

Motor Power Creates New Farm Implements—In the manufacture of agricultural motor implements the thought is coming to the surface that it should be possible to do with a single tool the work which is now either done imperfectly with the plough alone or with considerable waste of labor succesively with a plough and a harrow or with spade and hoe. The perfect condition in which, for example, the mole leaves the ground which it throws behind it, suggests a tool somewhat of the shape of its obliquely working shovel-like forefeet provided with pointed claws on the cutting edge. An innovation in this direction is the Linard-Hubert motor plough with "striking shares" which took part in recent agricultural contests in France. Another is shown in the accompanying illustration of the tool used with the farm-work tractor made by Heinrich Lanz of Mannheim, Germany, under patents to Koeszegi. This tool is a rotary hoe. The triangular hoe blades are not tangential to the circle in which they rotate but at a sharp angle with a tangent and have been found efficient in various trials by agricultural societies in Germany for producing the desired loosening of the deeper portions of the soil as well as the proper mixing of manure with the top soil, while the edges of the discs of which they form a part take care of the first breaking of the surface.—*Deutsche Technik*, November 1.

Harking Back a Decade

FROM *The Motor Review*, December 5, 1901:

Banker Brothers have incorporated under Pennsylvania laws under the title Banker Brothers Company, capital $50,000. The company is considered the largest dealing in motor vehicles at retail in the United States. It has taken on the Peerless line in addition to its other stock.

The horse-drawn stages on Fifth avenue, New York, are all destined for the discard. The new electric stages with red wheels and yellow bodies make a fine show.

With the first of the year the Winton Motor Carriage Company announces that its capacity will be between twenty and twenty-five complete automobiles a week. J. Bechtel, formerly superintendent of the Black Manufacturing Company, at Erie, making bicycles, has been added to the Winton staff as a mechanical expert.

William E. Metzger has been appointed Detroit agent for the Winton. Carl G. Fisher, of Indianapolis, will distribute the Winton line in that territory. Harry Fosdick, of the Locomobile Company, has resigned to accept the Winton agency in Boston.

The Stearns Steam Carriage Company announces that in future when it sells a car, it will send an expert instructor with the car to its purchaser to teach the buyer how to run it. The buyer is expected to pay the expert's expenses, but the company will pay his salary.

The first motor delivery wagon to make its appearance in Lawrence, Mass., is a steam car made by the Mobile Company of America. It has a covered body, capacity of 1,600 pounds and a speed of 20 miles an hour.

The Knox company secured enough business from the recent show to keep its factory busy on three and four-wheelers for a period of three months. The four-wheel model for 1902 is an attractive car and proved itself a hill-climber recently by going up the Cross street hill at Springfield, Mass., making the ascent half way on high gear. The car performed well despite the fact that it was a crisp morning.

The E. R. Thomas Motor Company explains the fact that its new cars were not exhibited at the recent show on the ground that it does not believe in fall shows. The chief objection raised was that other manufacturers attend fall shows simply to get ideas for their own product. Hence it reserved its exhibit until a time when it will be too late for competitors to copy.

The first race meeting ever held in Washington took place Thanksgiving Day. Three events were run, one of which was for gasoline cars. This was captured by Lewis Hill, name of car not given.

The National Capital Automobile Club and the Washington Touring Club have decided to amalgamate. The new clubrooms will be in the Pope building.

Ten members of the Rhode Island Automobile Club have contracted to buy 20-horsepower Winton cars especially adapted to racing. Plans are on foot to build or secure a race track near Newport.

Exports of automobiles and parts from New York for last week were just under $7,000 in value.

The Krastin Automobile Manufacturing Company, recently incorporated at Cleveland, expects to employ 200 men in its new plant. The company has experimented with a new type of gasoline automobile and expects to begin operations immediately.

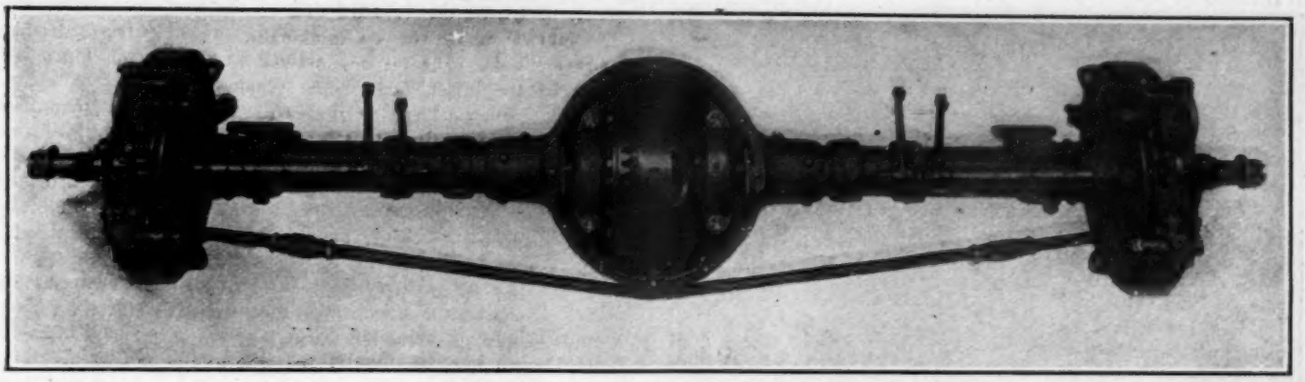


Fig. 1—View of the G. J. G. rear axle, showing rigid construction

Unit Power Plant Features the G. J. G.

FOR the season of 1912 the G. J. G. Motor Car Company, of White Plains, N. Y., has brought out a chassis, equipped with a unit power plant. The motor has four cylinders cast in pairs, with a bore of 3 3-4 inches and stroke of 4 1-2 inches. The horsepower of the motor is rated by the makers at 26. The valves are all on the same side of the cylinder. Water jackets are cast integrally and are made so as to provide easy water circulation. The material from which the cylinders are made is reverberatory air-furnace iron. To provide an easy turning moment for any position of the piston the cylinders are offset a distance of 3/8 inch.

The pistons are made of extra length so as to provide a good bearing surface, and eliminate chances of compression leaks. They are provided with three eccentric rings fitted with lap joints. The material in the pistons is also of reverberatory air-furnace iron, and in order to provide for a good fit, both the pistons and rings are ground to size. The wristpin is fitted into a bushing of good size and so arranged as to give a small amount of clearance for the upper connecting-rod bearing. The wristpin bushing is open at either end so that oil may pass into it, and through an opening into the bearing. There is a slight counterbore in the cylinder just above the top of the stroke.

The connecting rods are fitted to the wristpin by a clamp joint through which a bolt passes by means of which the tightness of the wristpin bearing may be regulated. At the lower end of the connecting rod the bearing is of good width. The material in the connecting rods is open-hearth steel, and they are drop forged and hardened. At the lower end they are fitted with bushings of die-cast cadmium nickel bronze. The connecting rods are of I-beam section, according to the usual practice.

The crankshaft is made from a drop forging of carbon steel which is heat-treated and ground. It runs upon three main bearings and is flanged at the rear end in order to provide a fastening for the flywheel, which is bolted thereto. The three bearings are located as follows: two at the ends of the crankcase and supported by webs in this casting, while the third rests upon a bridge formed by a vertical partition which extends across the crankcase.

The camshaft is a one-piece forging hardened and ground to size, and having large diameter. The cams, which are integral parts of the camshaft, are provided with a wide face to eliminate rapid wear. The camshaft is driven by means of three spur gears located in a casing at the forward end of the motor. This casing is shown at G, Fig. 3. These three gear wheels constitute the entire driving mechanism for the camshaft, water pump, magneto, etc., and hence noise due to clashing gears is eliminated as far as possible. The valves are made with nickel steel heads and carbon steel stems, and are set side by side on the left side of the motor. The lifter rods are actuated directly by the cams, and the mechanism is made certain by the employment of large springs which are fitted on seats just above the adjusting screws. The springs and adjusting nuts are readily ac-

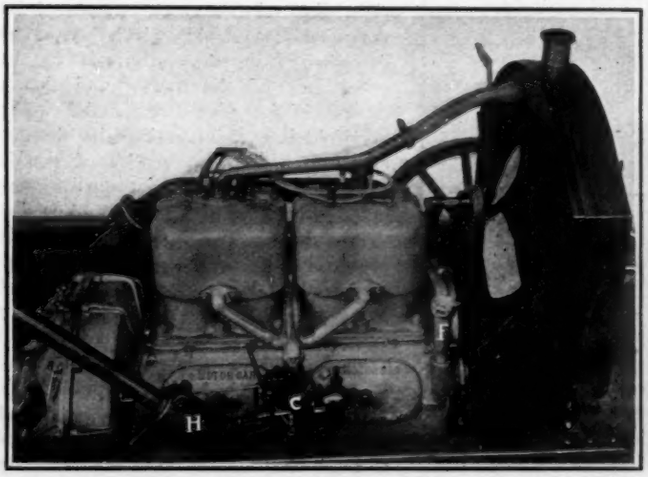


Fig. 2—Water and gas manifolds are cast integrally

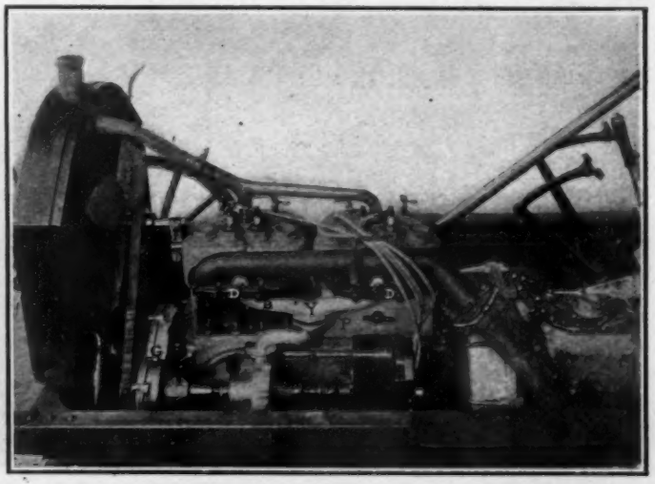


Fig. 3—The compact valve side of the G. J. G. motor

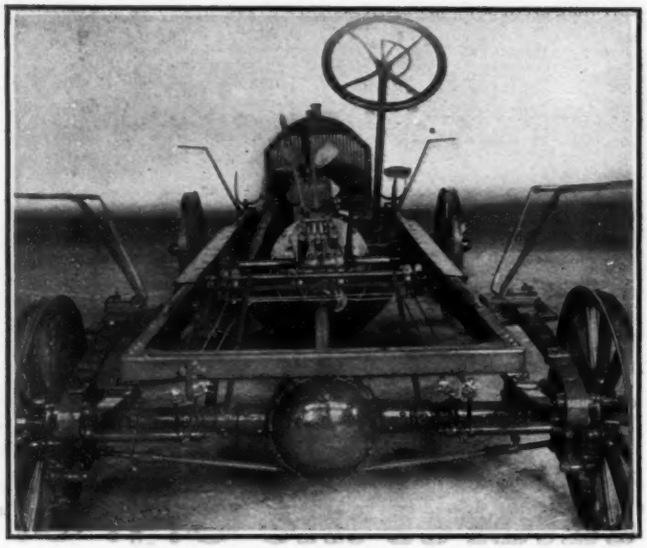


Fig. 4—End view of chassis, showing rear axle suspension

cessible by the removal of the side cover-plate P. This cover plate is held by a bolt which can be turned by hand as may be seen from the illustration. The adjustment nuts are for the purpose of regulating the valve action when it becomes necessary after having ground the valves to a considerable extent. These adjustment nuts will also compensate for wear in other parts of the valve mechanism.

The water by means of which the motor is cooled is circulated by a centrifugal pump which is driven by a gear through a transverse shaft. The water intake manifold surrounds the gas intake manifold and passes from the left side of the motor between the two central cylinders transversely across the crankcase to the right side of the motor. After having passed clear of the cylinder castings the water intake pipes are led to the lower part of the jackets on the right side of the motor, and are fastened there by elliptical flanges through which pass two bolts. After having circulated through the jackets, which are so shaped as to be wider near the top, or more heated part of the combustion chamber, the water is led back to the upper part of the radiator. The connection between the water outlet manifold and the radiator intake is of rubber hose 1 1-4 inches in diameter. It is fastened to the manifold by means of a clip T. A similar clip secures it to the intake pipe of the radiator. The radiator is of the Mercedes type and is cooled by means of a four-bladed aluminum fan, driven by an adjustable belt from the forward end of the magneto shaft. The fan bracket is supported by a small flange on the forward end of the first cylinder at F.

The lubricating system is a combination of the force-feed and gravity methods. The oil is contained in a reservoir which is formed by the lower part of the crankcase casting. A gear pump at the forward end of the casting lifts the oil from the reservoir and transmits it to a lead above the crankshaft. This oil flows into pockets along the walls of the base chamber so arranged as to lead directly through ducts to the main bearings. The oil flows through these ducts by gravity and amply lubricates the bearings, which are lined with die-cast cadmium nickel bronze scraped to fit.

Other leads are fitted over the crank bearings and so arranged that the oil will also flow into them by gravity, thus giving them an ample supply. Besides lubricating the crank bearings the oil will be thrown by centrifugal force, due to the rapidly revolving crankshaft, up into the cylinders, the walls of which will be covered by a supply of oil after the engine has been running for a short time. The piston on its downward stroke becomes covered with the oil, then on the next succeeding upward stroke carries it to the upper part of the cylinder, thus lubricating this important member. Besides lubricating the cylinder the oil thrown off the revolving crank also lubricates the camshaft and all other revolving parts of the motor.

Details of the Lubrication Scheme

After having lubricated the motor the oil will drip back to the lower part of the casing and eventually drain to the bottom of the crankcase. A screen is inserted through which all the oil must pass before it can again enter the oil pump. At the suction opening of the oil pump there is a slight depression in the bottom of the crankcase reservoir which forms a sort of oil-well. This depression will insure a quantity of oil for the pump in case the engine should be going up a hill without having an ample supply of oil in the base. The pump is on the same shaft as the timer and is so arranged that no stuffing gland is used; therefore, there will not be any chance of leakage at that point. On the right side of the crankcase at the forward end there is a projection into which the oil filler pipe F, Fig. 2, is inserted. It is provided with a screen of wire gauze through which the oil which is put into the crankcase must pass. This precaution obviates the chances of waste or other foreign material entering the crankcase while the oil supply is being replenished. The crankcase which contains the oil system is of aluminum alloy of barrel design. This construction gives great rigidity and durability.

Ignition is effected by means of the Bosch dual system, consisting of Bosch high-tension magneto, which delivers current to one set of spark plugs while an independent set of spark plugs may be used in combination with a battery and coil set for starting purposes.

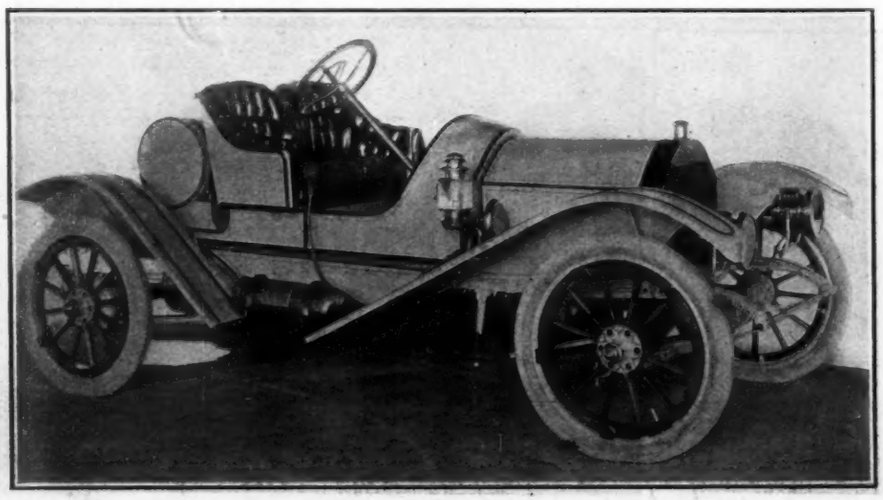


Fig. 5—Runabout body which is fitted to the G. J. G. chassis

The carbureter C is located on the right side of the motor supported by the intake manifold, which passes as described from the carbureter to the other side of the motor, and thence to the intake port. Since the water manifold is cast integrally with the gas manifold a uniform quality of gas is assured at all times on account of complete gasification of all the gasoline due to the heat. The intake manifold is provided with a flange to which the Y-shaped piping is fitted as shown at Y, Fig. 3. From this point the gas passes directly to the intake ports.

The exhaust manifold is provided with an outlet of 2-inch steel tubing. It is held in position by means of broad flanges and stud bolts B which pass through the dogs D. On the rear dog a clip is fastened as shown at R which

holds the wires from the magneto and secures them against the vibration of the car. The exhaust manifold is led back to a position parallel to the rear end of the rear cylinders. It then dips down and ends in a flange at Q where the exhaust pipe which leads to the muffler is joined to it and held tight against leakage by means of a gasket fitted between the flanges.

The clutch is of the multiple-disc type and is contained in the flywheel. A view of the clutch housing may be had in Fig. 7 at C. This housing, which is continued back from the crankcase, is of aluminum alloy and ribbed so as to give strength and rigidity. A vertical flange passes around the circumference of the housing and forms the means of connection between it and the gearset housing. A hand-hole is fitted at H so that inspection is easily possible. The clutch is so designed that a constant stream of oil is poured upon it while the engine is in motion. The discs of which the clutch is composed are of saw steel tempered and ground. The clutch is operated by means of a pedal shown at P, so constructed that a very light pressure upon it will release the clutch.

Power is transmitted through a short shaft to the gearset. This is of the three-speed selective type, having 2¾-inch shifter rods extending from the rear of the case. Each of these shifter rods is 1⅜ inches from the center line of the motor and 4 14/32 inches above the shaft. The change speed lever is shown at L and works in the H-quadrant Q. The gearset shafts are carried on imported ball bearings, while the gears are all designed so as to have a large diameter and a wide face. The material of the gears is high carbon steel, heat-treated and hardened. The gear-shifting shafts are equipped with a positive interlocking system so arranged as to positively eliminate the possibility of two pairs of gears being in mesh at the same time. All studs, nuts and shafts are made from selected high-grade steel.

A universal joint fitted in the casing D takes up the transmission of power from the gearset and delivers it to the propeller-shaft. The propeller-shaft is surrounded by a torque-tube in order to eliminate strains due to irregularity of the road.

From the propeller shaft the drive is transmitted to the differential and semi-floating rear axle and thence to the rear wheels. The rear axle is encased in a pressed steel housing which is fitted at the differential with a circular inspection plate. In order to provide stiffness a tie rod is fitted which passes from the extremities of the axle beneath the differential casing and is joined by turnbuckles upon which adjustments may be made for tightness. The front axle is an I-beam drop forging having the spring seats forged integrally.

The Braking System Is Adequate

The brakes are on the rear wheels and work through equalizers on 10 3-4-inch brake drums. The service brakes are operated by means of a pedal, while the emergency brakes are controlled by the lever B, Fig. 7, on the left side of the driver's seat. The wheels are of the wood artillery type, having twelve spokes both front and rear. They are adapted for 32 x 3 1-2 inch tires all around. The tread is 56 inches, and the wheelbase 104 inches.

The chassis frame is of channel construction without drop. It is supported in front by semi-elliptic springs, while in the rear the springs employed are elliptic with scroll ends.

The steering gear is of the irreversible worm-and-sector type. It is inclosed in a housing at the lower end which may be seen at H, Fig. 2. The hand wheel is of 18-inch diameter constructed on an aluminum spider which holds the spark and throttle levers and quadrants. There is an adjusting screw fitted so that all wear on the worm may be taken up, thus increasing the life of this part of the steering gear. The control of the car is by means of the spark and throttle levers on the steering wheel, the brake and clutch pedals, and the two levers which are located on the left side of the driver's seat. An accelerator is also included in the equipment of the car, as well as a muffler cutout.

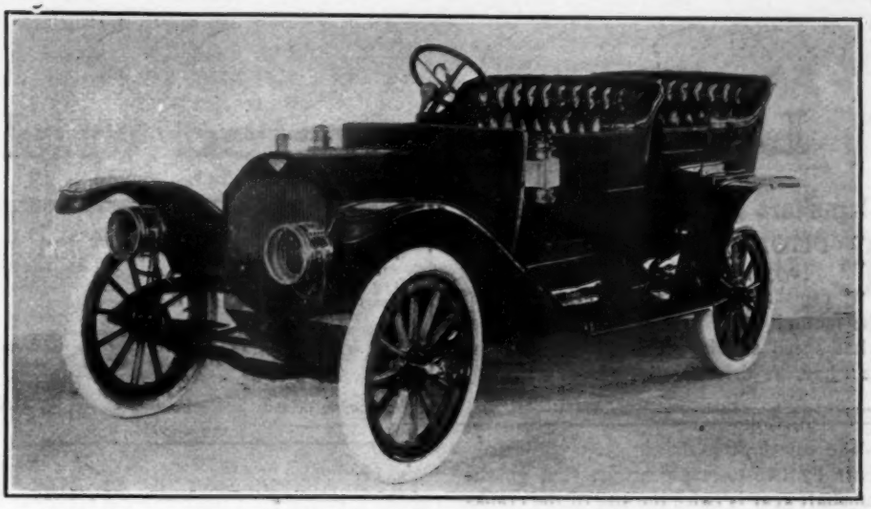


Fig. 6—The G. J. G. fore-door touring car for 1912

Other equipment consists of a full set of Dorian quick detachable, demountable rims, with an extra rim, gas head lamps and Prest-O-Lite gas-tank, oil side and tail lamps, horn, tire repair kit, oil can, pump, jack and full roll of special tools. The color is coachbuilder's deep blue, with black stripe, gold hairlines, and black leather upholstery. The bodies furnished on this chassis are the runabout or touring type as desired.

PISTONS OF ALUMINUM ALLOY—Several German, French and English houses now produce aluminum alloys whose strength and fusion point are sufficiently high to admit of the material being used for pistons and connecting rods. Such parts would have not only the advantage of lightness but, at equal strength with parts of steel, would be superior in rigidity and in ability to carry away heat from the combustion chamber. For this purpose the piston made of aluminum alloy might be provided with interior radiation fins, as has been done in a few instances before suitable alloys had been made commercially available.—From *La Vie Automobile*, Nov. 4.

Fig. 7—View of flywheel and clutch housing. Note control levers in center

Letters Answered and Discussed

Camshaft and Magneto Gears

EDITOR THE AUTOMOBILE:

[2,937]—How are the magneto and camshaft geared to the crankshaft of the motor? And in a four-cycle motor at what speed should the magneto-shaft and camshaft be driven?

C. B. AMES.

Pueblo, Col.

The camshaft is driven from the crankshaft by two-to-one gearing; that is, the camshaft gear is twice the size of the crankshaft gear, and hence the camshaft rotates at half the speed of the crankshaft. Usually the magneto is driven at the same speed as the latter. Fig. 1 shows the relative sizes of these gears and the way they are connected when a single camshaft is used; that is, when the valves are all on one side of the motor.

Nut-locking Device

Editor THE AUTOMOBILE:

[2,938]—Do you know of any way of preventing the jarring loose of small nuts (such as those on the magneto and carbureter), due to the vibrations of the motor and jar of the road? I have lost a number of them in this way and have wondered if there was not some means of holding them except by the use of an extra nut as a locknut.

C. N. TAYLOR.

Murfreesboro, Tenn.

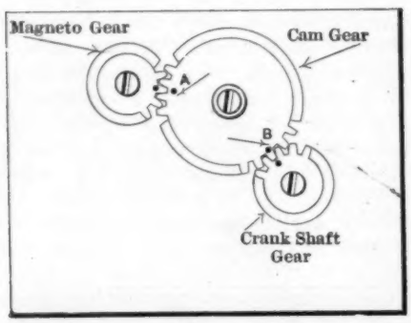


Fig. 1—Gearing for driving magneto and camshaft

Perhaps the form of locking device which you desire is shown by Fig. 2. This does not require the use of an extra nut, and is very simple. The spring piece is fastened with a pin at the smaller end and the other end is made so that it will just fit over the nut. When the nut is to be turned the piece is pressed down until the nut is clear. You should be able to purchase these holders where automobile supplies are kept, although it would not be a great deal of trouble to make them yourself.

The Editor invites subscribers to communicate their automobile troubles and personal experiences, stating them clearly on one side of the paper. If the nature of the case permits, send a sketch, even if it be rough, in order to assist to a clearer understanding. Each communication will receive attention in the order of its receipt, if the writer's signature and address accompany it as an evidence of good faith. If the writer objects to the publication of his name, he may add a nom de plume.

More Acetylene Gas Trouble

Editor THE AUTOMOBILE:

[2,939]—I have had considerable trouble with the gas supply for my headlights. They frequently sputter and go out when I am on the road and I find it necessary to blow out the piping in order to rid the system of water before I can get them to burn again. Is there any way to prevent this water from getting into the piping? I use an acetylene generator.

M. E. LONG.

San Francisco, Cal.

The way to rid the system of this water is to slant the gas piping down to a condensation trap. This trap should be drained occasionally in order to remove the accumulated moisture. It is a good plan to blow out the piping with a pump from time to time also. In our issue of November 9, on page 817, will be found an illustration showing a trap of this kind in place.

Horses vs. Motor Trucks

Editor THE AUTOMOBILE:

[2,940]—As a subscriber to your valuable magazine, I wish to ask if you can furnish any data regarding the relative cost and saving between a motor truck and a horse-drawn vehicle. Any figures that you may be able to furnish will be greatly appreciated. CHAS. F. MACKIN, JR.

Newark, N. J.

Any data that could be given in this connection would be of little or no value, as the conditions under which motor trucks are operated vary widely. The question of care in operation would also enter, thus involving the human element. When the speed and carrying capacity of the average large motor truck are compared with those features of the horse-drawn vehicle the former would seem to have sufficient advantage to counterbalance its increased first cost and expense of maintenance.

From figures covering over 1,000 gasoline trucks, it has been found that the operating expense is about 6 cents per ton mile, while for the same number of electric trucks this item becomes 7 cents per ton mile. These figures are exclusive of drivers' wages and garage expense.

Universal Joint Loss

Editor THE AUTOMOBILE:

[2,941]—What is the loss of power in the ordinary universal joint used in automobiles between the engine and the rear axle? H. L. WOODRUFF.

Anderson, Ind.

The loss to which you refer does not ordinarily exceed 5 per cent. It will depend entirely on the angle at which the shafts are working. The greater the angle between the axes of the shafts, the greater the loss.

Tire Pointers

Editor THE AUTOMOBILE:

[2,942]—In reading through your October 19th issue I noticed a letter in which one of your subscribers asked whether letting out the clutch in turning corners saved the tires. In your answer you stated that it did, and that there were a number of other little ways in which the driver could save on tire expense. Would it be possible for me to hear from you with reference to any of the "other little ways"? I do not care how brief your information may be, as the mere suggestions will aid me considerably. SIDNEY W. SALOMON.

New York City.

There are many other suggestions which might be offered as to the best ways of lowering tire expense, among them being to refrain from applying the brakes too hard or too suddenly, causing the tires to slip along the pavement or road and wearing them unnecessarily. Further, never run on a flat tire if possible to prevent it, as this is sure to rim-cut the shoe, often rendering it useless. Do not allow the tires to stand in oil or grease, and keep them free from rust along the beads where they come in contact with the rims. Rust eats into the rubber in a short time. Do not run in large ruts and avoid straining the shoes by hitting rough places at high speed. When drawing up to a curb, be careful not to snag the shoes against the stone.

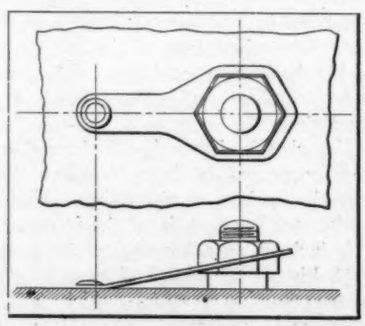


Fig. 2—A good nut-locking device.

Support the Rod

Editor THE AUTOMOBILE:

[2,943]—There seems to be a good deal of play and a tendency to sag in the rod which runs from the ball-and-socket joint below the steering column to the steering knuckle arm on my car. I have tightened this rod up as much as possible but it still rattles when the car is driven. Can you suggest any means of preventing this?

J. R. DAY.

Allentown, Pa.

The thread is evidently worn, and it would be wise for you to have the rod replaced, as it is not advisable to risk any mishap to the steering gear. A leather strap support for the side-rod, as shown by Fig. 3, is sometimes used, and no doubt this would stop the rattle to which you refer, at the same time preventing the sag of the rod and the excessive wear on the thread. This strap should be fastened somewhere near the ball-and-socket joint, as shown.

Radiator Drain Cock

Editor THE AUTOMOBILE:

[2,944]—How can I get the water out of my radiator? In laying up my car for the winter I want to drain the water from the motor, but there seems to be no provision for doing this. Will you please tell me where the drain cock is usually located, as I may conclude to have one put on.

C. J. ANDREWS.

Morton, N. Y.

Most cars have a radiator drain cock located, as shown by Fig. 4, in the water outlet pipe at the bottom of the radiator. If your car is not provided with a drain of this kind, you should either fit one to the pipe yourself, or have a repairman do it for you. No car should be without such a fixture, as it is often necessary to draw off the water from the cooling system for one purpose or another.

Engine Ratings

Editor THE AUTOMOBILE:

[2,945]—As I am a subscriber to your valuable magazine, I want to ask a question to determine in my mind the different horsepowers of different bores of engines. For instance, a 3 3-4-inch by 4 1-2-inch motor is rated at 25 horsepower; one 4 1-8 inches by 4 1-2 inches is rated at 35 horsepower; one 4 inches by 4 1-2 inches at 30 horsepower, and one 4 3-8 inches by 4 1-2 inches at 45 horsepower. How can a motor jump, say, 10 horsepower on an increase of only 1-4 inch in bore? Please explain and give me the table of different bores. Do they change the gears to make this difference? If so it must kill the speed of the car.

J. A. CROUP.

Graysville, O.

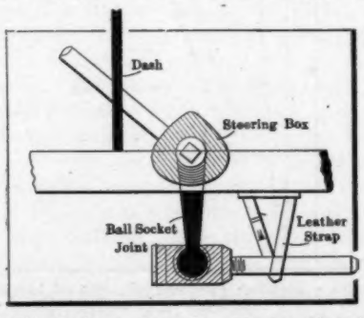


Fig. 3—Strap support for steering side-rod

The rated horsepower of a motor does not depend solely on the diameter or bore of its cylinders. There are several other factors which enter into this rating. The cylinder bore, piston travel per stroke, number of explosions per minute and the explosion pressure are all taken into account in computing the indicated horsepower of a motor. The formula used is as follows:

$$IHP = \frac{PLAN}{33{,}000}$$

, in which IHP is the indicated horsepower, P is the explosion pressure acting on the face of the piston, L is the length of piston stroke in feet, A is the area of the piston in square inches (which involves the cylinder diameter) and N is the number of explosions per minute (usually equal to half the number of revolutions per minute in a four-cycle engine). This is the exact method for determining the rating and it will be seen that two motors of the same bore might have widely different horsepowers. For purposes of comparison the A. L. A. M. rating for engines is usually employed. The formula adopted is $\frac{D^2N}{2.5}$. D is the cylinder bore in inches, N the number of cylinders and 2.5 a constant, based on the average view of the A. L. A. M. engineers as to a fair conservative rating for a four-cycle motor at 1,000 feet per minute piston speed. This, however, is merely comparative and in a great many cases does not come very close to the actual power of the motor. Based on this latter formula, there is a table of cylinder bores with corresponding horsepower values published by the A. L. A. M.

The gears have nothing to do with the rating of the motor.

Desire to Start Club

Editor THE AUTOMOBILE:

[2,946]—The automobile owners in our locality are preparing to organize a club for the purpose of bettering road conditions and erecting signs along the road for the guidance of drivers. I thought it possible that I could secure information through your columns where we could get some data as to by-laws and other matters pertaining to the formation of such an organization.

A. P. ODE.

Calmar, Iowa.

If you will address the American Automobile Association, 437 Fifth Avenue, New York City, the desired information will be gladly forwarded to you.

Care in Laying Up Cars

Editor THE AUTOMOBILE:

[2,947]—Would you kindly give me a remedy to prevent the rusting and damaging of my radiator and water cooling system while my car is out of service, as I have put it away for four months?

J. B. MOORE.

Wallace, W. Va.

In laying up your car for the winter the cooling system should be drained of all the water by opening the drain-cock at the bottom of the radiator. Then the motor should be started and run for a minute or so to dry up any moisture which may still remain in the system. Of course care should be taken not to heat up the motor in doing this.

The gasoline should also be drained from the tank, and the car should be jacked up and rested on blocks or horses in a substantial manner so that the tires may be deflated to a low pressure. It is even better to remove the tires, wash them carefully, wrap them in strips of paper or cloth and store them in a dark place the temperature of which is as nearly constant at about 50 degrees as possible. If the wheels are not jacked up the tires are apt to flatten from standing too long on one spot.

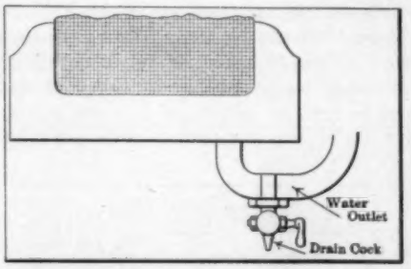


Fig. 4—Showing drain cock in water outlet

Not Very Far

Editor THE AUTOMOBILE:

[2,948]—Apropos the anti-freezing mixture discussion, how far could a four-cylinder automobile go with impunity without water in the radiator in zero weather, also in freezing weather when the temperature is about 32 degrees Fahrenheit. I am speaking, of course, relative to water-cooled cylinders.

GREENHORN.

Cleveland, O.

While we have not heard of the experiment being actually carried out, the automobile would run just long enough to allow the cylinders to get red hot, the lubricant to burn up, the pistons to seize and the wristpin bearings and others to burn up. In a word, a water-cooled motor should never be allowed to run for more than a minute or two without water circulating properly through the cooling system, if serious results are to be avoided. The high temperature within the cylinders makes it necessary to carry the excessive heat away by means of an effective circulation of water through the jackets, even in the coldest weather.

Little Bits of Motor Wisdom

Pertinent Pointers of Interest to Repairman and Driver

REMOVING GEARS FROM THEIR SHAFTS—Often it is very difficult to remove magneto or camshaft gears which are fastened to the shafts with keys, or which have been sweated on, especially if they have remained in place for a considerable length of time. Occasionally the shaft is bent, due to the force exerted when the gear is driven off from one side in the usual manner with hammer blows on the end of a rod or other tool, which, in turn, is held against the hub of the gear. A very good method for the removal of these gears is shown by Figs. 1 and 2. Two views of the tools used are shown at A and B, Fig. 1. These tools can be made of any pieces of steel which are handy, or out of an old file or two. The space between the prongs need not be over an inch to an inch and a quarter for use in connection with camshafts

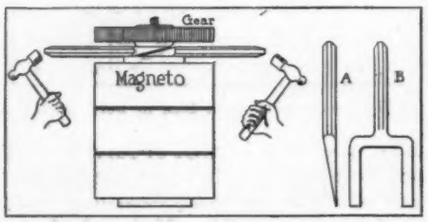


Fig. 1.—Removing magneto gear and the special tools to use

and the like. It should be wide enough to easily clear the diameter of the shaft. The prongs should be tapered from a point at the ends to about three-eighths of an inch at the thickest parts, and they should be about two inches long. For removing a magneto gear, two of these tools are used, as shown by Fig. 1. They are placed back of the gear with their tapered parts in contact, and are driven toward the center with hammers. The wedging action lifts the gear from the shaft. Fig. 2 shows the same tools being used for the removal of a camshaft gear. In this case the shaft is placed in a vise with the gear hub close to the jaws. The tools are then driven in between the tops of the vise jaws and the gear hub in the same manner as before. It should not be necessary to strike very heavy blows with the hammers, although sometimes these gears are very firmly fastened to their shafts.

FLAME PROPAGATION.—The internal expansion engine such as is used in automobiles is peculiar in that the expanding gases which drive the piston are heated directly within the cylinder. The ideal condition in any motor is to attain the highest possible mean effective pressure, this being not only true in the gas engine but in all engines which are operated by means of a cylinder or other expansion chamber. The indicated horsepower of an engine depends directly upon the mean effective pressure and, all other things being equal, will vary directly with that factor. It is not an easy matter to determine the mean effective pressure within the cylinder of a gasoline motor without an extensive apparatus, but the various conditions which affect it are well known so that in the design of the motor it can be varied to any degree required within practical limits. There are two conditions which are of the greatest importance in fixing this quantity; one of these is the compression and the other the rate of flame propagation.

The amount of compression is easily determined by the volume of piston clearance left within the cylinder after the piston has reached the highest point in its stroke or the upper dead center. The rate of flame propagation is affected by a variety of features in the construction of the engine and the condition and quality of the gas which is within the cylinder. The current theory as to the propagation of the flame in the cylinder of a gas engine is that the flame spreads in all directions at the same rate of speed through a quiescent mass of gas. This condition is approached more or less in the cylinder of a gas engine, although it cannot be ever entirely the case owing to the presence of some of the dead gases of the previous explosion in every automobile motor.

In any gas engine cylinder there is a given quantity of gas which will have to be ignited and burned, and the sooner this charge is burned in relation to the stroke of the motor the less chance there will be for any of the unburned gas to escape with the exhaust products and the sooner, in relation to the stroke, will the maximum pressure be reached. Since it takes a definite and fixed length of time to burn each similar charge within the cylinder of the gas engine, the sooner the gas is completely fired the further will it have progressed in its period of burning and expansion and the lower will be the terminal pressure. The pressure of the gases on exhausting is just so much thrown away, and hence the necessity for producing conditions which tend toward rapid combustion and flame propagation. It is for this reason that a perfect mixture is a condition which is to be desired, since either a lean or rich mixture will fire much more slowly than a perfect combination of gas and air. The mean effective pressure is governed by the position of maximum pressure of the indicator card and the pressure at exhaust, and, as is pointed out above, the sooner the maximum pressure is attained with reference to the stroke of the engine the lower will the terminal or exhaust pressure be.

The propagation of the flame is much more rapid if it is allowed to start in all directions at once, and it is for this reason that it is not good practice to have the spark concealed behind a wall or in a pocket. The rapidity of flame propagation is also affected to a great extent by the pressure of the gases. This is another point in favor of high compression, as a gas which has been compressed to the extent that is common in the automobile engine cylinder will burn very rapidly and hence will attain its maximum pressure very early in the stroke. It has not as yet been possible, however, in spite of the high compressions to attain a perfect combustion of the gasoline in the cylinder, hence a large amount of combustible material will also be found in the exhaust products.

PISTON RINGS.—As is well known, one of the greatest sources of loss of power in a motor is the leak of the compressed gas past the piston rings. This leak may be due to the fact that the cylinder is out of round,

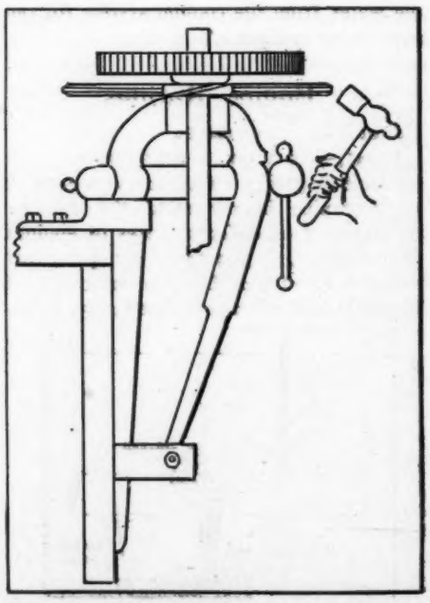


Fig. 2—A camshaft gear can be taken off in much the same manner

it may be due to the rings being worn, or to their being ill-formed or designed. In the modern motor, the rings are almost invariably of the eccentric type, that is, their thickest part is opposite to the point where they are split to admit of their being sprung over the pistons and into place. The metal is thinnest at the joints. The theory

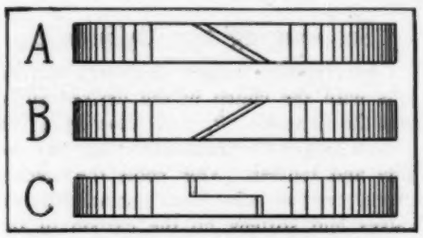


Fig. 3—Rings with lap joints are best

involved in their design so as to get the correct eccentricity is rather exhaustive, but the reason for their being made this shape is that, when the ring is in place, it will, theoretically, expand equally and exert the same force in all directions against the cylinder wall. Circular rings will not do this, but will have the greatest tendency to spread out at the point where they are split. This causes leakage, and, hence, this form of ring has almost entirely been abandoned in favor of the more correct, yet harder to make, eccentric ring.

The usual ways in which rings are split are shown by Fig. 3. At A and B are shown diagonal cuts, but the best form is seen at C. It is easier for the gas to get through the diagonal joints than the lap joint, as the angles of the latter offer more resistance to its passage.

Many motorists may think points of this kind of little importance, but if it is ever found to be necessary to replace worn or broken rings, the lap joint ring should be used in preference to the other. Much time has been devoted by automobile experts and engineers to this particular seemingly small item of design, and it is on account of just such refinements that the representative motor of to-day is as perfect and reliable as it is.

When Replacing Gaskets.—Care should be exercised in renewing worn-out gaskets so that the packing is not cut smaller in internal diameter than the holes, thus partially or wholly obstructing the passages. In cutting gaskets, the best way to go about it is to take the part which has the clear holes for the bolts or screws and support it firmly in a vise or in some other manner. Take the material from which the gaskets are to be made and lay it smoothly over the opening, where the gasket is to go, and with the ball peen of a hammer tap it lightly around the edge of this opening. This marks the rubber or other gasket material with the exact outline which the gasket is to have, and it is then a simple matter to cut the correct shape. If the gasket material is very thin, this tapping around the edge with a hammer will usually cut the desired shape immediately, and will make a very good job. In case copper or other thick material is to be used, the hammer makes the outline and the gasket can then be cut out accurately by the use of shears, chisels and punches. Gaskets made in this way are more accurate, and there is less possibility of their being out of shape so as to clog the joints.

Pipe Bender Useful.—It is often found necessary to bend a pipe so as to make it accommodate a desired space, or so that it will lead in a different direction. Pipe benders of different sizes are manufactured for the purpose, and several of them should be included in the garage equipment. Fig. 4 shows a form of bender, which is made up of a coil of wire, slightly tapered at one end so as to be readily removable after the pipe has been bent to the desired shape. The pipe is first heated so as to be easily worked, then the proper size bender is inserted in it, and the pipe bent over a form. The bender prevents the pipe from flattening out at the bend, and preserves its

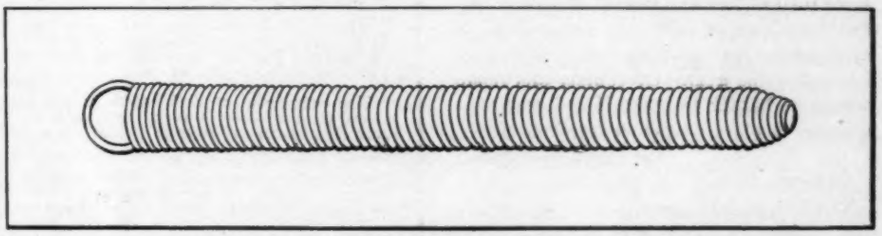


Fig. 4—Pipe benders are sometimes useful in the garage

circular form. After the operation the bender is withdrawn and the pipe allowed to cool.

This tool is sometimes useful in fitting manifolds and their immediate piping, also for attaching cooling-water pipes. There should be as little obstruction to the passage of the water or gas as possible, and bad bends where the pipe is flattened should be avoided, as they do not admit of free passage and increase the fluid friction.

The Cone Clutch.—Cone clutches are of two types, the internal and external. The external clutch is one in which the flywheel forms the female member and the male cone is forced into it by means of a spring or springs; this is the most common type of clutch in use to-day; it is the simplest to manipulate and the adjustments are easily made. The clutch is comparatively inexpensive and any repairs which have to be made will generally be in the nature of refacing the clutch with new leather or of simply treating the leather with which the clutch is fitted. By allowing a leather-faced clutch to slip too much, a glaze is imparted to the facing which spoils the engagement; in fact, in many cases where this glaze is excessive the clutch will either not take up at all or will take up so fiercely that the occupants of the car will be violently jerked about.

Leather can be made to give better service by applying a dressing. The leather of a clutch is the same as the leather of a shoe in that it will need occasional dressing to keep it in condition. A shoe which is never dressed soon acquires a hard, brittle condition which can only be remedied by the application of a softening compound. The dressing to be applied in the case of the leather-faced cone clutch is neat's-foot oil. The clutch leather will absorb this preparation readily at first and several applications should be given with the clutch pedal blocked out so that it is disengaged. When the leather appears to be well saturated allow the clutch to stand disengaged for the night and it will be found that in the morning the leather will have become greatly rejuvenated and regained a large amount of its lost flexibility.

With a leather-faced cone clutch easy engagement is often obtained by inserting springs beneath the surface of the leather. The springs are either of the coil type or are flat. When the coil springs are used they are generally placed on the inside of the cone and are used in connection with plungers which pass through the cone and press against the inner surface of the leather. When the flat springs are employed they are generally fitted in a recess in the metal cone beneath the surface of the leather, and when fitting the leather they are sprung. They bear constantly against the surface of the leather and lift it in spots. There are about twelve of these fitted on a 16-inch clutch.

A clutch brake is often fitted with this type of clutch so that it will be automatically applied when the pedal releasing the clutch is pressed down. This will greatly facilitate the changing of gears. It is very essential in the life of the clutch that the car should be started on the lowest speed and then gradually brought up to the highest speed so that there will be no tendency to slip.

Carry a Small Board When Touring.—Many times when on the road it is necessary to jack up a wheel for one reason or another. A small piece of 2-inch by 4-inch board about a foot long will then come in very handy to stand the jack on, especially if the road is muddy, or the ground very soft. This also serves to make the jack higher and gives it a greater height of lift.

My Best Automobile Repair

Some Quick Repairs Made in the Garage and on the Road

A Difficult Repair

EDITOR THE AUTOMOBILE:

Perhaps some automobilists would hesitate to undertake the repair which I have shown by Fig. 1, but I did not have a great deal of trouble doing it, and perhaps some of your readers would be interested. Two of the teeth on one of the timing gears became damaged, and, as there was no repair shop handy, I made the repair as shown. The face of the wheel was dovetailed out, and then a bronze casting, B, was made, having approximately the shape of the teeth and the dovetail at the bottom. This was driven into the recess in the gear face. Next a template was made from one of the good teeth A, and the rough cast teeth B were then filed to conform with it. Holes were then drilled and tapped into these new teeth, and two set screws D were put in, the metal strip C being interposed between their heads and the gear. Of course, this repair would be harder to make if the gear were of steel in place of the softer bronze.

C. K. AIME.

Lansing, Mich.

Use of Old Casings

Editor THE AUTOMOBILE:

I have been very much interested and have found many valuable suggestions in your automobile repair articles. In the issue of November 23 A. D. Hard gives some good pointers as to the use of old casings.

I have found it very hard to spring any kind of a complete casing over another one. Tears from tire-irons, especially on old casings, will inevitably occur. My method is to build up an old casing from the inside, filling in all irregularities and cleaning both casings, as suggested by Mr. Hard. Then make a copious application of cement to one-half of the inner side of the casing which is to be used outside. Kink the one to be used inside by grasping the beads with both hands and pulling outward and upward at the same time, using counter pressure with the knee. This causes the inner casing to look like an inverted bar horseshoe. While holding the inner casing kinked as described, have an assistant apply a coating of cement to the circular part and place it within the debeaded outside casing. Then carefully allow the inner casing to spring back into its original shape, at the same time working it into the outer casing. The cement can be readily applied between the uncemented portions; then, if too much of the bead has not been cut off, a remnant of it will go under the rim.

Put the casing on the wheel immediately, and apply ten pounds pressure to the tire for a half-hour. After that time, inflate the tire to its normal pressure and keep the wheel jacked up for at least 48 hours, in the meantime wiping off any exuding cement and pressing with the fingers at any places along the bead edges where there is a tendency for separation.

In all tire repair work by amateurs sufficient time is not allowed for drying before use. I have found the slow drying rubber fillings much more permanent than the quick drying ones. The first mentioned kind takes two or three days to dry, but it does not crack and makes one continuous filling, while the latter kind cracks and works out.

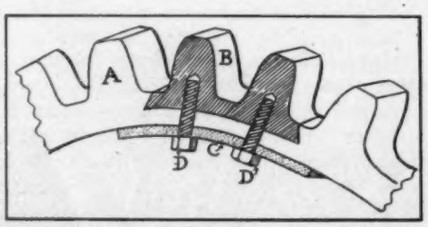


Fig. 1—Showing method of replacing damaged gear teeth

Temporary automobile repairs made by the driver or owner while on the road and permanent repairs made in the garage after the run is over, are interesting to all automobile owners.

It may be a spring leaf has broken; a shackle bolt or strap may break; a steering tie rod is bent; the car skids into a curb and bends a steering arm or the starting crank; a throttle or magneto connection breaks owing to vibration; a radiator leak is started by a stone or some other means; a leak in the gasoline tank is discovered; there is a small hole in the gasoline feed line; a brake facing may burn out; a brake connection breaks; a front axle gets slightly sprung; a clutch starts slipping, or any one of a thousand things may happen.

Every automobile owner is interested in knowing how repairs have been made, how long it took to make them, how much they cost, and by whom they were made.

We want you to write in simple language in a letter what repair of this nature you have had to make, how you made it, how long it took you and how much it cost.

You can make with your lead pencil one or two rough sketches indicating the broken or damaged part and showing how the repair was made.

The experience of each reader is interesting to every other reader. Analyze your past experiences and send in one or two of them.

Give your name and address, legibly written. If you do not want your name to appear, make use of a nom de plume.

Editor THE AUTOMOBILE.

Scavenging the Cylinders

I have another hobby. I always descend hills with the clutch in the desired speed and the batteries off, thus allowing a full charge of gas to circulate through the engine and muffler. This cools the engine, cleans the combustion chambers and exhaust valves and softens up the carbon in the muffler.

If the spark is well advanced and the throttle opened wide on an immediately succeeding level stretch most of the carbon will be burned out of the muffler.

I also invariably speed up my engine on stopping, even if I do not intend to start on compression. This forces all dead gases out of the cylinders, since by throwing the gears into the neutral and shutting off the engine the flywheel turns it over and forces new gas into the cylinders. Dead gas, standing, will usually precipitate solid carbon.

"MOTOR WOULD-BE-WISE."

Plymouth, Pa.

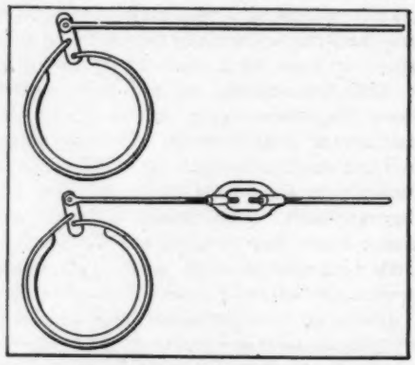


Fig. 2—Turnbuckles are easily attached to the brake-rods

Put on Turnbuckles

Editor THE AUTOMOBILE:

I have an old car which formerly did not have provision for the adjustment of the brake-rod tension. I decided to put turnbuckles on these rods, as shown by Fig. 2. I cut the rods in two at the middle with a hacksaw, then took out about an inch of each rod, so as to allow for the adjustment. A thread cutting die was then procured and a male thread cut on one end and a female thread on the other. I then had two turnbuckles cast, and the same number of threads cut in them as on the rods. After applying them to the rods I found, of course, that the efficiency of my brakes was very much increased.

Dubuque, Ia. C. P. ROGERS.

My Ideal 1912 Automobile

Readers' Conceptions of What Next Year's Car Should Be

Readers continue to demonstrate their interest in the ideal car and the specifications which are submitted show a wide range of taste and requirements. In view of the interest shown the Editor continues to extend the invitation to all who entertain ideas on this absorbing topic to submit their opinions for publication. The description should be legibly written on one side of the paper and signed by the sender, although if it is so desired the name will not be published.

Rather Dreamy

EDITOR THE AUTOMOBILE:

My conception of a modern motor car will certainly come in the class of "ideal," but the mark of 1912 will hardly apply, as it is rather doubtful if my car will be on the road before 1915.

The motor of this car will be of six cylinders cast in pairs, operating on a two-part cycle. The crankshaft is carried on four large plain bearings and is drilled for lubrication under pump pressure. Two flywheels will be used, both of small diameter so as to allow the motor to be set very low in the frame and still have ample clearance. The rear fly wheel will house a dry plate clutch consisting of a small number of large size plates, each pair of which is separated by a friction member which takes the wear and is easily renewed. The front fly wheel is not attached direct to the crankshaft, but is driven through a multiple disc clutch held in engagement by a spring of such strength that at certain engine speed a slight slippage will occur which will dampen the periodic vibrations common in most six cylinder motors.

Each cylinder is of the two piston design, the upper power cylinder having a bore of four inches and a stroke of six inches. The lower charging cylinder is of such size as to have a volume slightly in excess of the power cylinder and connecting passage. Pure air only is drawn into the charging cylinder from the crankcase. This tends to muffle the noise of air induction, produces a slight vacuum in the crankcase which prevents oil leakage, heats the air slightly and charges the air with an oil mist which will be sufficient lubrication for the charging cylinder. The compressed air charge is conducted to the adjacent power cylinder of the pair through a combined rotary valve and passage way. One valve is used for each cylinder, two being placed in each block on opposite sides between the cylinders. These valves are operated through worm gears by two secondary shafts driven by a single silent chain from the crankshaft. The upper end of each valve extends through the top of the cylinder casting and carries a cam which operates the fuel pump atomizer for that cylinder. The strokes of these pumps are adjustable from zero to maximum, and are controlled the same as with the usual throttle. The ignition system is double throughout, except the dynamo, and both operate all the time. The dynamo, which also supplies current for the car lights, is driven by silent chain from the rear end of one of the secondary shafts. Current is kept constant by means of a governor which instead of controlling the speed of the armature controls its position in the field. As the speed of the motor changes, the armature is shifted in and out of the field. When the motor is stopped this governor automatically switches on the current from the storage battery to supply the lights.

The cooling of this motor is through a new type of radiator carried on the dashboard, the hood of this car being of the Renault, or, more properly, the Franklin type, as there is no radiator visible from the outside. By means of a mercury pressure regulator, the temperature of the cooling water runs to about 300 degrees before boiling, which adds greatly to the efficiency of the engine. Water circulation is by a thermo gravity system, as the bottom of the radiator is well above the bottom of the water jackets.

The excess compressed air is carried in a tank and used for starting the motor and inflating tires. The gear box is carried on the rear axle and is "nearly gearless," as only two gear sets are furnished, one for reverse and one extra low for extra hard pulls, starting on direct drive being possible with this flexible motor.

Brakes are of the multiple disc type, carried in the rear wheel brake drums, and operated by the two foot pedals. No brake lever is used and the speed change lever is carried in the center of the car.

The wheelbase of this car will be about 120 inches, with tires 36 x 5.

Any standard body will be fitted to suit the user.

Accessibility, ease of replacing wearing parts, comfort for the passengers, noiselessness and high motor efficiency are points striven for in this ideal car.

GUESSER.

Brocton, Ill.

Desires Interchangeable Body

Editor THE AUTOMOBILE:

In my opinion, the ideal automobile for 1912 would be a six-cylinder, 40 horsepower car, weighing about 3200 pounds, and fully equipped with top, lamps, tools, horn, baggage rack, tire irons, speedometer and clock.

The motor would be either of the valveless type or it would have valves in the head, with the valve-springs enclosed. The carbureter would be of the double-jet type with an auxiliary air valve, adjustable from the seat. The cooling system would consist of a cellular radiator of ample size, gear-driven pump and gear-driven fan. Ignition would be by means of a storage battery and Bosch magneto with two sets of spark-plugs. The splash system of lubrication with auxiliary force-feed to the crankcase would be used. The transmission would be of the selective type, four speeds forward and reverse, with direct drive on high. Shaft drive with bevel gear would be used, and I would have both internal expanding and external contracting brakes on the rear hubs. I would want the brake-bands so arranged as to be readily adjustable and all parts of the braking mechanism accessible.

As for the body, it would be arranged with the driver's seat on the right. Several bodies would be part of the equipment, and they would be made to fit the same chassis, so that touring car, roadster, phaeton, limousine, coupé or landaulet could be used as desired.

The wheels would be made for 36-inch by 4½-inch tires, and the rims would be quick detachable. The springs would be semi-elliptic, and there would be shock-absorbers attached. I would want a B. & L. Castor front axle, so as to make driving easier and safer. The steering gear would be irreversible, of the worm and sector type.

This car would not be very expensive, if made in sufficient quantity.

F. G. ENSON.

Newburgh, N. Y.

Specifies Two Mufflers.

Editor THE AUTOMOBILE:

My idea of a 1912 automobile is as follows: Knight motor, bore 2½ inches, stroke 7 inches, four cylinders, underslung frame, 122-inch wheelbase, 38-inch by 4-inch tires, four speeds ahead, four-passenger body with plenty of room in the tonneau, full floating axle, 20-inch by 2½-inch brakes, tires carried under the back seat. I would also have two mufflers, one alone to be used in the country and the two together where absolute silence would be desired.

SHERMAN FAIRCHILD.

Oneonta, N. Y.

Automobile Metallurgy Made Easy

By E. F. Lake

Part III

Elongation and Reduction of Area

(Next Week—Torsional Strain)

ELONGATION, which is sometimes called extension, and reduction of area, which is sometimes called contraction, are also important factors that are shown by the tensile testing machine.

When a test bar is pulled until it is broken, it stretches or elongates. This elongation is always given in percentage. A certain gauge length is taken as a unit. The distance that the specimen stretches beyond this, from the time pulling is started until the break occurs, is figured as the percentage of this unit, and this is called the percentage of elongation. The elongation up to the elastic limit is very slight in most metal and does not indicate any particular property of importance; it is also difficult to obtain. Two inches on the length of a test bar has generally been accepted as the unit from which to figure the percentage of elongation for automobile materials. For some other uses, and in some other places, 8 inches has been standardized as the unit.

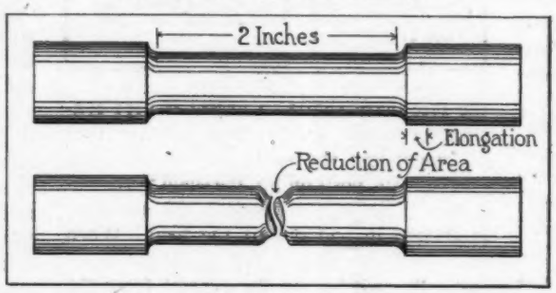


Fig. 1—Test bar before and after it was pulled apart

Elongation gives an idea of the plasticity and ductility of metals. While these are properties that may be beneficial in some places and for some kinds of work, they have very little place in automobile construction, unless it be for bearings or in places that require very little strength or stiffness. As plastic means softness in metals, those that are plastic are easily forced out of shape and they would have a high percentage of elongation. Ductility means that metals can be easily drawn or twisted and thus forced out of shape, whereas stiffness is what is required of nearly all automobile parts.

A certain amount of elongation is necessary, however, as this would indicate properties that overcome brittleness. As a rule, the greater the percentage of elongation, the less will be the brittleness, and vice versa. For instance, high carbon steel that has been hardened in water or brine, would have hardly any elongation and be so brittle it could easily be broken by a sharp blow. Such steel might even have a very high tensile strength and elastic limit, but as there is no give to the metal when the blow is struck, it is fractured, being a great deal like glass. If the same steel were thoroughly annealed, or softened, it would have a comparatively high percentage of elongation with very little brittleness and thus be very difficult to break.

For most parts of the car, therefore, it is necessary to have some elongation in the metals, but this elongation does not want to be anywhere near that shown by a rubber band. If it were the metal would be practically useless. Elongation is the least important of the four properties shown by the tensile machine. On account of the elongation shown by such materials as rubber, many metallurgists are claiming that it should be ignored when testing steels and reduction of area or contraction be made the real important property of these two.

Reduction of area is a phenomenon that always accompanies elongation. In pulling test bars they do not elongate throughout the whole distance of even the 2-inch length that the percentage is figured from, but the stretching is confined to a small space. Nothing is added to the volume of metal as the specimen is stretched and consequently its original diameter is reduced. The cohesive force, which binds the molecules together, causes them to flow toward the center of the test bar and reduce it in diameter while it is being stretched out lengthwise. The shape that these test bars take at the break is shown in Fig. 1. This shape varies considerably, however, as some metals might elongate considerably and not contract very much; others might contract a great deal and not elongate very much.

The cohesive force varies considerably in different metals or alloys and hence there is no uniform ratio between the elongation and the reduction of area. For instance, a large elongation over a short distance in the specimens length, might only show a comparatively small reduction of area owing to the cohesive force not drawing the molecules as closely together as it would in other specimens, or other metals.

This contraction or reduction of area is also figured in percentage. The area across the original test bar before breaking is taken as the unit on which to figure this percentage. The amount that this area has been reduced, at the point of breakage, is then figured as the percentage of this unit, or the percentage of the reduction of area.

The reduction of area shows the toughness, density, hardness and cohesion of metals and, therefore, is a very important factor in judging their mechanical properties. In fact it is one of the most important of the four properties shown by the tensile machine. If the figures for the elastic limit and the reduction of area can both be made high in one piece of metal, it is the ideal condition to attain. As an instance of this, one gear maker said, "An ideal carbon steel for transmission gears is one that would have 85,000 pounds elastic limit, with a reduction of area of 45 per cent." Either one of these figures is easy to obtain in these steels, but it is difficult to find a brand or to so work it mechanically and heat treat it that both figures will be obtained.

Heat treatment affects the percentage of elongation and reduc-

EFFECT OF HEAT TREATMENT ON ELONGATION AND CONTRACTION

Heat-treatment.	Percentage of	
	Elongation.	Reduction of Area.
Annealed at 1475° F.	29	59
Quenched in brine from 1650° F	4	16
Quenched in oil from 1650° F.	9	32
Drawn at Various Temperatures	12	41
	17	57
	18	65
	17	62
	20	68
	21	66

tion of area, as well as the tensile strength and elastic limit. It affects these, however, in diametrically opposite directions. That is to say, when steels are hardened, their tensile strength and reduction of area are raised. Then the metal is very hard and shows a high strength when given a straight pull. The low figures for elongation and reduction of area show that the metal has lost nearly all of its plasticity and ductility as well as its toughness and density. It would, therefore, break easily if given a sharp blow or if bent, or twisted. By drawing this hardness, as in tempering, the percentage of elongation and reduction of area is raised, bringing back some of the ductility and toughness, while the tensile strength and elastic limit are lowered, thereby reducing strength in that direction.

The effect of heat treatment on the elongation and contraction of a nickel steel is shown in the table. The action on the tensile strength and elastic limit was given in my preceding article entitled Elastic Limit. Pieces that go into the various parts of an automobile must be heat treated in a manner that will make them withstand strains. Almost all the pieces are treated differently in this regard as their work is different.

Glycerine in Steel Treatment

Intermediate grades in the hardening of steel, especially tools, are difficult to control, as oil does not mix with water and the method of floating a layer of oil on top of the quenching bath gives indifferent results, while quick dipping in oil followed by complete cooling in water requires considerable skill and does not always produce the results aimed for. In practice the degree of hardness imparted to the cutting edge of a tool is either that produced, in the grade of steel used, by quenching in oil or that produced by quenching in water. Higher degrees of hardness may be produced by using brine and by other well-known means, but the considerable range of variations in hardness while lies between oil and water quenching is not under effective control. The use of several different kinds of oil, such as rape seed and fish oil, of different fluidity and conductivity, is a complication in the ordinary shop, and cooling by air-blasts of varying intensity is applicable to high-speed steels only. In this situation, the use of glycerine instead of oil recommends itself, as it is miscible with water in all percentages and also readily receives those admixtures of salt and acids which may be desirable for graduating the hardening effect of the bath. And this substance has been found to impart to the bath exactly the same qualities which characterize oil. It softens the temper and obviates distortion of the hardened article.

While no formulas good for all requirements can be given, anybody familiar with hardening work can readily find for himself the admixture of glycerine which suits his special purposes, just because the admixture may be made in any desired percentage. Guiding examples may be offered, however. For a medium average hardness, a bath as the following may be found suitable to start with: Glycerine, 8 kilograms; water, 10 kilograms; cooking salt, 1-2 kilogram; sal-ammoniac, 100 grammes; concentrated hydrochloric (muriatic) acid, 50 grammes. And for a bath producing sharp hardening 66 weight parts of glycerine with 100 parts of water, 18 of sal-ammoniac, 24 of cooking salt and 2 of alum may be tried. The baths should always be stirred before first using, to make sure of uniformity.—From *Metall-Technik*, October 14.

FROSTED CARRIAGE WINDOWS—In the winter the windows of a closed automobile draw moisture from the respiration of the occupants and easily freeze up or at least become clouded with vapor. Two simple ventilators, one in each upper corner of the vehicle, to the rear, reduce this annoyance and cause no drafts.—From *La Pratique Automobile*, Nov. 10.

It is mentioned in *The Auto* (London) of November 18 that "Antimist" is a preparation supplied by Dunhill's for the same trouble, with special reference to windscreens and goggles. It is a waxy substance put up in the form of a pencil, which is rubbed on the glass. The latter when polished regains complete transparency, but sheds mist.

Calendar of Coming Events

Shows

Dec. 30-Jan. 6.....Buffalo, N. Y., Annual Show, Seventy-fourth Regiment Armory, Buffalo Automobile Trade Association.
Jan. 2-11.....New York City, Hotel Astor, Importers' Salon.
Jan. 6-13.....New York City, Madison Square Garden, Twelfth Annual Show, Pleasure Car Division, Automobile Board of Trade.
Jan. 6-20.....New York City, Madison Square Garden, Annual Show, Motor and Accessory Manufacturers.
Jan. 10-17.....New York City, Grand Central Palace, Twelfth Annual Show, National Association of Automobile Manufacturers; also Motor and Accessory Manufacturers.
Jan. 13-19.....Milwaukee, Wis., Auditorium, Fourth Annual Show, Milwaukee Automobile Dealers' Association
Jan. 13-27.....Philadelphia, Annual Show, First and Third Regiment Armories, Philadelphia Automobile Trade Association.
Jan. 15-20.....New York City, Madison Square Garden, Twelfth Annual Show, Commercial Division, Automobile Board of Trade.
Jan. 15-20.....Toledo, O., Annual Show, Terminal Building, Toledo Automobile Dealers' Association.
Jan. 22-27.....Rochester, N. Y., Annual Show, State Armory, Rochester Automobile Dealers' Association.
Jan. 22-27.....Detroit, Mich., Wayne Gardens, Eleventh Annual Show, Detroit Automobile Dealers' Association.
Jan. 22-27.....Providence, R. I., Providence State Armory, Rhode Island Licensed Automobile Dealers' Association, Automobile and Accessories Show.
Jan. 27-Feb. 10....Chicago Coliseum, Eleventh Annual Automobile Show under the auspices of the National Association of Automobile Manufacturers. Pleasure cars, first week. Commercial vehicles, second week.
Jan. 27-Feb. 10....Pittsburgh, Pa., Sixth Annual Show, Automobile Dealers' Association of Pittsburgh, Inc. Pleasure cars, first week. Commercial vehicles, second week.
Jan. 29-Feb. 3.....Scranton, Pa., 13th Regiment Armory, Second Annual Show.
Feb. 1-7.....Washington, D. C., Annual Show, Convention Hall.
Feb. 3-10.....Montreal, Canada, National Show, Drill Hall, Automobile Club of Canada.
Feb. 5-17.....St. Louis, Mo., Coliseum, Annual Show, Pleasure cars, first week. Commercial vehicles, second week.
Feb. 12-17.....Ottawa, Ont., Howick Hall, Annual Show, Ottawa Valley Motor Car Association.
Feb. 12-17.....Kansas City, Mo., Annual Show, Combined Association of Motor Car Dealers.
Feb. 14-17.....Grand Rapids, Mich., Third Annual Show.
Feb. 17-24.....Pittsburgh, Pa., Second Annual Show, Exposition Bldg., Pittsburgh Auto Show Association, Inc.
Feb. 17-24.....Newark, N. J., Fifth Annual Automobile Show, New Jersey Automobile Exhibition Company, First Regiment Armory.
Feb. 17-24.....Minneapolis, Minn., National Guard Armory and Coliseum, Annual Automobile Show, Minneapolis Automobile Show Association.
Feb. 19-24.....Omaha, Neb., Seventh Annual Show, Auditorium, Omaha Automobile Show Association.
Feb. 19-24.....Hartford, Conn., Annual Show, Automobile Club of Hartford, State Armory.
Feb. 20-24.....Binghamton, N. Y., State Armory, Third Annual Show, Automobile Dealers' Association.
Feb. 20-28.....Baltimore, Md., Annual Show, Baltimore Automobile Dealers' Association.
Feb. 21-28.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
Week Feb. 22.....Cincinnati, O., Annual Show, Cincinnati Automobile Dealers' Association.
Feb. 24-March 2...Brooklyn, N. Y., Twenty-third Regiment Armory, Annual Show, Brooklyn Motor Vehicle Dealers' Association.
Feb. 26-Mar. 2.....Elmira, N. Y., Second Annual Show, Elmira Automobile Club.
Feb. 26-Mar. 2.....Paterson, N. J., Annual Show, Fifth Regt. Armory, Paterson Automobile Trade Association.
Feb. 28-Mar. 2.....Davenport, Iowa, Annual Show, Davenport Automobile Association.
March 2-9.....Boston, Mass., Tenth Annual Show, Boston Automobile Dealers' Association, Inc.
March 4-9.....Denver, Col., Auditorium, Annual Show.
March 4-9.....Denver, Col., Annual Show, Auditorium, Motor Field.

Meetings, Etc.

Dec. 20.....New York City, Waldorf-Astoria, Annual Banquet of the Automobile Club of America.
Jan. 18-20.....New York City, Annual Meeting of the Society of Automobile Engineers.

Race Meets, Hill-Climbs, Etc.

Dec. 25-26.....Los Angeles, Cal., Track Races, Motordome.

THE AUTOMOBILE

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Nobody Hurt

ONE of the best features connected with the running of the grand prize, the Vanderbilt, the Savannah and the Tiedeman races last week at Savannah was the fact that nobody was bodily injured during the actual running of these races. This pleased every spectator around the circuit. There may have been those who went to the races with the hope of seeing a car upset at a curve or run through a fence, but they went home better pleased at seeing everything go off well. This fact was commented on in every quarter after the completion of the races. True, there were a couple of serious accidents during practice, one of which resulted fatally and the other in the serious injury to one or two persons and in the damaging of several cars. That accident in which a driver was killed was not due to the course or to anybody on the course. It appears that the car was going too fast out of a double turn and could not be held on the road. The other accident was due to touring cars on the course during practice.

The question was asked several times at Savannah how it was that no one was injured out of the forty-six starters in four different races. There are several explanations: In the first place the drivers with fast cars were nearly all, in fact, all seasoned drivers, drivers who know automatically when a left or right rear tire explodes, which one it is without having to turn round and look or have the mechanic look, and drivers who know automatically and instantly what to do in case of tire trouble. These are the two great reasons why Savannah was free from accidents. There were plenty of tire explosions—they took place on every lap. Some of the drivers averaged a tire change every other lap for the twenty-four circuits of the grand prize race and yet they were not once in the ditch. The only answer was that they were seasoned drivers. At nearly all of the other big races this year there have been a number of names comparatively new in road racing and an analysis will show that in the majority of cases the accidents have happened to these novices. In the majority of cases the accidents have been due to tire explosions. Because of this fact it appears to be more imperative that the drivers before being granted a license to drive in a track race, a road race, a beach race or a hill-climb, be subjected to a tire explosion test. They should be compelled to drive on a broad straightaway and have one of the rear tires exploded at high speeds in order to ascertain, first, if the driver can tell by the movements of his car which tire has exploded and also, if he can properly control his machine. The distance that his car swerves to the right or left should be measured and if it exceeds one-half the width of a road, as used for road races, an accident would likely result and the driver should be refused a racing license.

After a series of big races is the proper time to learn the lessons that are, or should be, enforced at succeeding races. The only accident that resulted fatally at the Savannah races took place during the first day of practice. The driver was taking the turns too fast before he was familiar with them. This suggests that every precaution should be taken on the first day or so of practice. That perhaps only half of the cars should be allowed on the course at once and that each driver should be cautioned against fast driving. Much of the fast driving in early practice is done for advertising purposes. The driver wants to get a little credit in practice; he may think that he will not have much chance in the race. Often the team manager is very close to the ears of some newspaper reporter and wants to get it all over the land that his car has made such-and-such time in practice. There is always a reason. Quite often the time for practice is short and the driver really has to try out his different speed ratios in order to study how to take the turns.

The Savannah Automobile Club, the citizens of Savannah and the soldiers deserve hearty congratulations on the conduct of the races. The course was kept clear from start to finish and the public was well safeguarded by safety fences, by keeping them back from the turns and by guarding all of the dangerous places on the course. The soldiers again demonstrated the fact that they are equal to any emergency, and with such a corps of soldiers it would be possible to keep a course equally clear in the heart of Long Island or in Westchester county, New York. Keeping road race courses clear is simply a matter of purpose. When the purpose is there the rest is easy. It means getting the troops on the ground early and taking possession before the crowds get there. In guarding a course an ounce of prevention accomplishes more than a ton of cure. It would take a big army to clear a course after the mob had positioned its cars all over on it and after the masses had taken up positions that they would have to leave.

The recent series of Savannah races further demonstrated the fact that a 17.14-mile course is too long and that a 10-mile one would be much more preferable, particularly with small fields of cars, such as at present, when not over sixteen compete in one race. At Savannah there were frequently 3- and 4-minute waits and during these the interest of the crowd waned, and as some expressed it, "They forgot that there was a race on." The 10-mile course with a wider roadway is better for holding the interest of an audience than a longer course, particularly during the last half of a race.

Harmony Reigns at A. A. A. Meeting

GREATEST in size and importance of any of the annual meetings of the American Automobile Association is the one held Tuesday at the Astor in New York City. Almost 100 delegates responded to their names at the preliminary roll call and practically all the clubs identified with the national organization were represented either by an officer or by proxy. There had been rumors of dissensions that were scheduled to break out during the meeting but aside from one ineffectual flare the proceedings moved along with harmony and precision.

Vice-president Bonifield, backed by a numerous Ohio delegation and with some scattering support from other states, was supposed to be the leader of the opposition, but when it came to actual proceedings the trouble did not materialize.

The contention was that a resolution introduced at the last meeting by Dr. Bonifield and adopted by the association provided for holding the next annual meeting in the Middle West. Such an entry was not found upon the minutes and Dr. Bonifield and his supporters prepared to have the minutes changed to show such action. The proposed changes were defeated by a vote of 4 to 1 and Dr. Bonifield was given permission to file two affidavits tending to support his contention that such a motion had been made at the last meeting.

When the delegates finally came together on a friendly footing it was explained that the resolution introduced by Dr. Bonifield last year had been held up pending an opinion as to the legality of the plan to hold the annual meeting of the association outside of New York. This opinion was adverse under the existing condition of the association's charter. A change in the charter was thereupon advised, placing the power to fix meeting places anywhere in the country in the province of the Executive Committee.

The meeting then heard the reading of reports covering its work during the past year. President Hooper covered the whole field generally in his report and was followed by Chairman Terry of the Legislative Board who recounted the work of getting good laws upon the statute books and preventing bad ones from being enacted. He dwelt upon the influence of the association in standardizing state laws to their present status and spoke at some length as to the chances of federal legislation. He declared that the federal registration bill only needed one more determined effort to place it upon the book of national laws. He emphasized the necessity for such a law, even with the contingency of general reciprocity.

Chairman Diehl of the Good Roads Board outlined briefly the activities of his committee, paying particular attention to the assistance that had been given the work by the National Association of Automobile Manufacturers. He subscribed to the report of Chairman Terry with respect to Federal registration and applied it to the cause of federal aid in road building.

Chairman Longstreth of the Touring Board told of the extensive map work that had been done under his direction and Chairman Schimpf of the Contest Board presented a summary of the contest work of the year. Among the figures given out by Mr. Schimpf were the receipt of over $10,000 for sanction fees; $1,000 for driving licenses; $7,000 for stock car certificates and the expenditures of his department. His report showed a balance on hand of $57.

Powell Evans also made an interesting report on international relations in which he discountenanced further attempts to make foreign maps for use in touring abroad. He called attention to the fact that the Michelin Tire Co. distributed free many thousands of interesting maps and road directions for use in foreign countries and warned the assembly that unless the A. A. A. did something toward getting out books on American roads for use of foreign tourists, the tire concern would certainly forestall the association in that field also.

Horace A. Bonnell, treasurer of A. A. A., presented the last of the general reports when he read the balance sheet covering the finances of the year. According to Mr. Bonnell's report, the receipts for the year were about $35,000 and that sum together with $9,000 on hand, at the beginning of the period, constituted the treasury of the A. A. A. Against this sum there were expenditures of about $41,000, leaving a balance in the treasury of about $3,000.

The expenditures covered salaries, the largest item; expenses of various sorts and subscription to the *American Motorist* of $6,700. The receipts showed a subscription of $5,000 by the N. A. A. M. and the payment of Contest Board bills by the M. C. A. amounting to about $2,800.

In the afternoon there were a number of addresses and discussions detailing the work shown in the annual reports. Tuesday night the association enjoyed its annual banquet, the largest and best attended function of its kind in the history of the asassociation.

The following officers were nominated and elected: Robert P. Hooper, Pennsylvania, president; Frank M. Joyce, Minnesota, first vice-president; Laurens Enos, New York, second vice-president; C. L. Bonifield, Ohio, third vice-president; Ralph W. Smith, Colorado, fourth vice-president; F. L. Baker, California, fifth vice-president; A. G. Batchelder, New York, chairman executive committee; H. A. Bonnell, New Jersey, treasurer; John N. Brooks, Connecticut, secretary. Executive committee: L. R. Speare, F. G. Staples, Frank G. Webb, H. L. Vail, P. J. Walker, H. E. Coffin, Frank M. Joyce, J. G. Weeks, E. C. Smith, A. H. Knoll, J. H. Edwards, Dr. A. P. Overgaard, H. J. Clark, G. M. Robinson, John A. Wilson, David Beecroft, John N. Brooks, Powell Evans, P. M. Milner, J. P. Coghlin, Paul C. Wolff, James T. Drought, S. A. Miles, F. C. Battey, Charles E. Doe, Edwin S. George, H. A. Bonnell, H. C. Peck, H. B. Race, W. E. Moyer, H. M. Rowe, S. D. Capen, H. L. Gordon, W. M. Stevenson, Oliver Quayle, W. E. Metzger, C. H. Verschoyle and Preston Belvin.

Chairmen of boards: C. T. Terry, legislative; George C. Diehl, good roads; Howard Longstreth, touring information, and William Schimpf, contest board.

The annual banquet was presided over by President Hooper as toastmaster. Among the speakers were: L. R. Speare, C. T. Terry, C. P. Chase, H. L. Vail, Alfred Reeves, A. L. Pope and A. G. Batchelder.

The association will meet probably at some point in the Middle West at its next convention. In the report of President Hooper a further amendment of the constitution was recommended empowering the executive committee to name the place, but it is doubtful whether the constitution of the association can be amended in time to allow that clause to become effective this year. The recent amendment allows the meetings to be held in cities outside of New York at the will of the association.

The whole convention was most harmonious and the get-together spirit was apparent in every move that was made. After the little storm cloud that threatened the opening of the convention had been dissipated, the program was carried out with much speed and accuracy. The general opinion that prevailed among the delegates was most optimistic as to the future of the association.

Owing to the fact that the routine matters of the association were completed with celerity, it was found to be unnecessary to hold any sessions after Tuesday night and consequently the subsequent meetings scheduled were declared off.

Members of the Society of Automobile Engineers Visiting the Panhard-Levassor Factory in Paris

S. A. E. on French Factory Visit

PARIS, Nov. 28—Scattered somewhat at the close of the English trip, the members of the Society of Automobile Engineers rallied in Paris, and, reinforced by some of the officials of the British Institution of Automobile Engineers, entered the Panhard-Levassor factory in an imposing group. This visit doubtless united a greater number of members than any previous one, and in view of the large amount of sight-seeing done during the previous week, and the many and varied outside attractions of Paris, spoke well for the enthusiasm of the members in following up the primary object of the trip.

Although there was not the same intimate relationship between the heads of the factory and the visitors as on some of the English visits, the directors evidently preferring to keep in the background rather than face the language difficulty, the Panhard-Levassor Company threw open every department of the factory and placed competent guides at the disposition of the visitors. The interest taken in this pioneer French factory was manifest in the difficulty in getting the members through the various departments; the megaphone man had to be very much on the job. With a staff of 2,300 men, the Panhard-Levassor Company produce a car a man per year; more of the car, however, is built by the factory than is usual in French concerns, the Panhard-Levassor Company making all its own castings with the exception of aluminum die casting, building its own wheels, and making most of the accessories except the magneto.

Knight motors were much in evidence, the sleeve valve engine now being employed on 50 per cent. of the chassis produced in this factory. As the total output includes a number of trucks, the Knight is in a considerable majority on the touring car chassis. Wood working machinery was the original business of the Panhard-Levassor Company, and although this has been considerably outgrown by the automobile work, it is still an important section. It is in consequence of the production of wood working machinery that the firm builds all its own wheels, contrary to the general practice in France. Hickory being difficult to obtain in Europe, acacia wood is employed for the spokes, ash generally being used for the rims. The wire wheel has only just been received into favor at this factory, and although it will be fitted on request, is not made a standard feature.

The efforts made by this company to assure a good supply of skilled labor were noted with interest. Owing to compulsory military service robbing every man of 2 years of his life, it is difficult to get youths to go through the usual period of apprenticeship. In consequence a special apprenticeship workshop is maintained, where, under the instruction of skilled mechanics, youths are put through a 3-years' course in practical and theoretical mechanics. During the 3 years nominal wages are earned, and on the completion of the term the youths pass into the main factory, eventually becoming shop foremen and draughtsmen, in the majority of cases. This system has the advantage under the factory laws of allowing the shops to work overtime and night shifts. Where youths and women are present, overtime is not legally allowed.

While the main party visited the Panhard-Levassor works, a small group of members went through the Bayard-Clement factory. These works more closely approach the American standard of organization and operation than any other in France, for they were completely built at one period, not having grown up from year to year, and are fitted with a large amount of American and other automatic machinery. More than any other, Clement has attempted to reduce the cost of production by reason of economic factory organization, automatic machinery, and a reduction in the number of models. A feature is made of completely equipped cars, the body work being done on the premises, only the specially high-class work being done outside. The Clement-Bayard Company possesses its own foundries and a supplementary factory at Mezières, in the French Ardennes, and it is there that all the castings are done and a certain amount of machining carried out; this has the natural tendency to make the Paris factory more in the nature of an erecting shop.

This firm is unique in being the only one to devote itself to the production of aeroplanes and airships. Working at first in conjunction with a balloon maker, the company has gradually extended the scope of its work until the complete airship is now built on the premises. The nacelle is an all-metal construction that can readily be undertaken in an automobile factory; the motors used in airships are mostly of the four-cylinder vertical type, with a cylinder bore of from 6 to 7 inches, and the fitting

has much in common with the automobile practice now in vogue.

Recently a section of the factory has been set aside for the construction of gas bags thus making the firm entirely independent of outside assistance. After being assembled and tested, the practice is to dismount the airships and transport them to the aerodrome at Compiegne, about 40 miles away, where assembly takes place and the trial flights are carried out. This aerodrome is without doubt the finest in the world, the balloon sheds being magnificent structures of steel and galvanized iron with cork lining, having special heating arrangements, electric light, wireless telegraphy installation, special workshops, and a large hydrogen producing plant.

While the main party occupied the afternoon of the first day's visit to Paris in inspecting the Lemoine factory, devoted to the production of axles and automobile springs, a smaller group was received at the Renault works, the largest in Europe devoted exclusively to automobile production and having an annual output of 6,500 cars. Very extensive additions are being made at the present moment to the Renault factory with a view to extensions in the truck line, and in order to enable the firm to make its own aluminum castings. At present all cylinder castings are made on the premises. At the close of the visit to the factory the members of the party spent an interesting half hour in conversation with Louis Renault, recognized as one of the most skilled engineers in Europe. Conversation naturally turned to the American invasion.

Louis Renault regretted that conditions were such in Europe that no manufacturer was able to devote himself exclusively to one or two models. In order to meet all requirements his factory was obliged to produce twenty different types; the European demand was not sufficiently great to allow any manufacturer to devote himself exclusively to one model.

He expressed it as his opinion that the less expensive grades of American cars would not get a permanent hold of the European market, but if they should do so he was convinced that the French government would remove the anomaly of a 25 per cent. duty on American imports into France, and a 50 per cent. duty on French cars going into the United States. For trucks carrying 2, 3 and 5 ton loads, Louis Renault gave it as his opinion that the use of rubber tires would have to be abandoned on account of cost. This was particularly the case in France where they had to compete with horse traction and cheap labor. The price paid for carrying a ton load anywhere within a 7-mile radius of the city of Paris was only 60 cents on horse-drawn vehicles, and in order to get down to this low figure with automobiles, it was necessary that tire maintenance should be abolished entirely. Renault has made a move in this direction by building 3 and 5 ton trucks fitted with steel tires, and is so convinced of their greater economy, that he recommends them in preference to rubber shod trucks.

To give an insight into the development of the aeroplane industry in France, a visit of inspection was paid to the Esnault-Pelterie factory at Billancourt, where Rep monoplanes and motors are built. The firm is occupied almost exclusively on military work, and produces an all-metal monoplane of unusual strength. Steel tubing is employed throughout for the fuselage of the machines, the entire front portion being encased with sheet aluminum, and the rear covered with rubbered cloth. The wings are the only portion of the aeroplane in which wood is employed. All the motors are built on the premises; they are five-cylinder type, air cooled, with valves in the head operated by a single overhead rocker arm. Three connecting rods are received on one pin of the two-throw crankshaft, and two on the other; the shaft is bored and has forced feed lubrication. An interesting mechanical construction was the fitting of the carbureter in the oil sump of the crankchamber in order to assure an even temperature in all weather conditions. The float chamber was outside and at the base of the motor, with the jet within the base and the intake pipe running right across the oil tank, then passing outside to a circular distributor from which the five cylinders were fed. The original intention was to pay a visit to the Rep aerodrome at Buc, but as weather conditions made flights impossible, this visit was abandoned.

Louis Delage, one of the leading French light car manufacturers threw open his works to the American engineers, and a number of the members of the party availed themselves of the opportunity of inspecting them.. This factory is one of comparatively recent origin, having been established 5 years ago with the object of building what is known as voiturettes. Single cylinder models only were produced at the commencement, but these were later driven out by four-cylinder cars, and the output now consists of two models only, a four-cylinder of 75 by 120, and a six-cylinder of 65 by 125 mm. bore and stroke; the present output is 1,000 cars per year. Delage was the winner of the last light car race held during the past season in France, under the 3 litre cylinder volume rule.

As a fitting close to the European trip, André Michelin entertained the members of the Society of Automobile Engineers with a dinner at the Automobile Club of France on the last day of the official visit. André Michelin, in rising to propose the toast of the President of the Sister Republic, stated that he knew 24 English words, and as seven of them were not fit to print, he believed it would not be possible to make a speech with the remaining 17. He, therefore, asked them to allow him to greet them in his own language, leaving it to his brother-in-law, Mark Wolff, to translate that greeting into English. In drinking to the success of the American automobile industry, Mark Wolff, director of the Michelin Tire Company, of London, hoped to see more and more American automobilists in Europe, and assured them that they would always find the touring organization of the Michelin company at their disposition.

Mr. Havvette-Michelin, manager of the Michelin factory at Milltown, N. J., thanked the Society of Automobile Engineers for the honor they had done them in accepting their invitation and expressed the belief that such gatherings would do much to strengthen the bonds which united the industries of America to France.

Howard. E. Coffin replied in the name of the American engineers and retraced the growth of the Michelin company from the earliest days to the present time with its establishments in four countries and its staff of 15,000 workers. The evening closed with a concert given by some of the most brilliant artistes of the opera and the Opera-Comique, and by a set of dances performed by Mlles. Chasles and Meunier of the Paris Opera house.

Although the official program of visits in France was not as elaborate as that drawn up for England, small groups and individual members of the party visited numerous other factories. A small number, too, extended their investigations to Germany.

Revival of Paris Annual Show

Finding the center of the European automobile market slipping away from Paris, in favor of London, Berlin and Brussels, the French Association of Automobile Manufacturers, presided over by Marquis de Dion, is determined that the annual automobile salon at the Grand Palais in Paris shall be revived and that the income from it shall be distributed among the exhibitors, so as to reduce the cost of staging the great show, rather than turning the profits into the treasury of the Automobile Club de France, whose leading men, René de Knyff and Louis Renault, "under the placid presidency of Armand Peugeot," are charged with the responsibility for having weakened the position of the French industry by first rendering the cost of the annual show prohibitive, for the benefit of the club, and afterward abolishing it; all for the selfish motive of preventing small and progressive manufacturers from making themselves conspicuous before the public and establishing a competition with the big and prosperous concerns which the leaders in the club represent. "The fight between the two factions is on, and soon the columns of the automobile press will reverberate with the echoes of the battle," says *L'Automobile Belge*, November 10.

Starting from Savannah in the tour around Georgia

Bell's Ferry across the Altamaha Ferry, outside of Toxley, Ga.

Georgia Tour Proves Hard Ride

ATLANTA, GA., Dec. 4—Slightly the worse for chilling breezes and dusty roads, but not otherwise disfigured, the Tour Around Georgia rolled smoothly into Atlanta Saturday afternoon and completed the second annual run around the Empire State of the South.

This tour left Atlanta, for an eleven-day trip on the morning of Wednesday, Nov. 22. It arrived at Savannah Saturday afternoon, Nov. 25. All of the tourists spent Sunday in Savannah and Monday at the race course, watching the running of the Vanderbilt. Then five cars, with W. B. Stovall, of Atlanta, acting as pacemaker in his Cole 30, checked out Monday morning at 8.30 and continued on a sort of informal jaunt to Atlanta. Those in this party included No. 57, Cole 30, W. B. Stovall, acting pacemaker; No. 40, Chalmers, Sheriff F. G. Edwards, of Dougherty County; No. 30, Buick, C. A. Holmes; No. 28, Cadillac, C. A. Fuller; No. 32, Buick, C. A. Thatcher.

These cars got away in the midst of a most depressing rain but once out of Savannah they met better roads and from that point forward found reasonably good going. Their trip to Atlanta was without special incident and they checked out, after a two-day run Wednesday night, Nov. 29.

The main body of the tourists waited for the running of the Grand Prize race, on Thanksgiving Day, and did not desert the scene of action until the very last gun had been fired.

This main body checked out of Savannah Friday morning, Dec. 1, with the coldest weather of the coldest early winter Georgia has ever known, making things generally unpleasant. Nor was the road from Savannah to Dublin, the night stop, any material improvement over the weather. It was frosty and bumpy going most of the day, with just enough warmth toward noon and just enough good going by spells to keep up the courage of the contestants.

Friday's run saw another perfect score go by the board, which was remarkable in a tour run on such liberal lines as the Tour Around Georgia. Overland 28 was the victim and in a collision with another competitor, also an Overland, its radiator was so badly injured that the car was put temporarily out of commission. A Dorris car, driven by George Fauss, towed the victim to Summit, where a repair was made.

The middle of the day proved the pleasantest part, for the weather improved materially and what with good roads into Statesboro, and a good lunch there at the Jaeckel House the tourists thawed out and cheered up materially.

The afternoon run was a mere matter of plugging along and all the cars, save the injured Overland, hauled into Dublin, the night stop, in good order. This town of Dublin was one of the cities most active in promoting the tour. The citizens want the Dublin route between Atlanta and Savannah accepted as official and in consequence were intensely interested in the present tour. This interest was shown Friday night by a tremendous ringing of bells and an amazing blowing of horns and playing of bands. At no place on the tour was the welcome any more sincere or enthusiastic than at Dublin. The day's run was 124.8 miles. The lunch stop was 50.7 miles from Savannah.

The last day's run of the Tour Around Georgia, was 152 miles in length and carried the tourists from Dublin to Atlanta over roads that were in the main good, and under skies that were fair enough.

The last section of the run, from Macon to Atlanta, was especially fine. This strip of road is one of the finest 100-mile straightaways in all Dixie and the tour cars fairly burned it up.

When the Round-Staters reached Atlanta they went at once to the Piedmont Driving Club, where they were checked out and where a beefsteak dinner was served. At this meal the tourists were the guests of the Atlanta Constitution, which has done much toward promoting and engineering the trip.

Owing to the intense informality of the run it may be several days before announcements are made as to the penalizations but it is probable that only three of the cars that participated will receive penalties.

The only prize thus far awarded was to the Overland No. 28, which was voted the trophy offered by the Atlanta Ad-Men's Club for the machine that met with the hardest luck while on the road. The Overland was the hard-luck car of the tour.

The tour just completed was probably the most successful state tour ever run in the South. It was the verdict of the few who took part both in this event and in the recent Glidden that the Georgia event was the harder of the two on the contestants. While the running time was slower and the rules less vigorously enforced the roughness of many of the strips of road and the roughness of the weather combined to make the affair decidedly rigorous.

It is worth noting, however, that the roads encountered on this year's tour were better than those traversed by the same tour last year, that there were more bridges and less fords and that the people in the counties where bad roads still exist were thoroughly awake to the need of better roads and were planning to get them.

In the Legal Field—Weed Chain Wins

ACCORDING to information received by Duncan & Duncan, of New York, attorneys for the Weed Chain Tire Grip Co., from Washington, the Supreme Court has denied the petition of the Excelsior Supply Co., of Chicago, for a writ of certiorari to review the decision of the United States Circuit Court which held in favor of the legality of the Parsons patents which are owned by the Weed company. The refusal of the Supreme Court to further consider this case is the final step in a long litigation. At present there are pending in New York and elsewhere over 175 cases brought by the Weed company, in all of which preliminary injunctions have been granted.

The United States Court of Appeals has issued interlocutory decrees against a number of defendants, based upon the Weed patents. Several of these suits are now pending before masters who have been instructed to determine the amount of damages involved.

Rubber Contract in Federal Court

Before the United States Circuit Court of Appeals in New York the final hearing of the suit of Henry A. Gould against the Pennsylvania Rubber Co. was held Monday and the decision is now being considered by the court. The Pennsylvania Rubber Co. sued Gould in the lower court to recover $16,592 for alleged failure to deliver to it 16,592 pounds of Manicoba rubber which was contracted for in June, 1909.

The defendant claimed that he had delivered 9,253 pounds of the contract amount and that the plaintiff company refused delivery tendered upon the remainder. A jury in Judge Hough's court awarded the Pennsylvania Rubber Co. $11,713 as damages and from this judgment Gould appealed. Gould imports rubber and the Pennsylvania company manufactures rubber goods.

The issue between the two is as to the quality of the rubber delivered. On the part of the company it is alleged that the rubber was rejected because it would not vulcanize evenly and the Gould concern declares that there was nothing in the contract to specifically provide for even vulcanization.

How Old Acme Company Almost Won

How the old Acme Motor Car Company almost got another lease on life back in 1906 was told in the New York Supreme Court last week, when the cases of Pirie versus Emery, Somers and Curran were decided in favor of the plaintiff. It appears that the automobile company actually had possession of enough money to tide it over the rough spot it was encountering but that an effort was made to stop payment upon two checks, aggregating $65,000, and while the stop was not permanently effective it resulted in a swarm of creditors swooping down upon the company at an inconvenient moment, causing its bankruptcy.

The story as told in court was one of intense human interest. Mr. Devlin, who was in charge of the Acme company at that time, was being pressed for payment of $55,000 due to a Mr. Horst on the purchase of the company's control. The company was also short of ready cash. Therefore, he arranged with the plaintiff Pirie for a loan of $65,000. The defendants Emery, Somers and Curran gave Pirie their notes and checks for a total of $40,000 and Pirie advanced two checks, one for $55,000, which was paid over to Horst and the other for $10,000 which Devlin deposited to the order of the company.

The next day after this was done, January 24, 1906, Pirie decided not to carry out the transaction and notified the defendants that he was going to try to get out and advised them to do likewise. Payment was stopped on the two Pirie checks and identical notes were written by the defendants disclaiming liability on the notes they had given.

But in the meantime the attorney for Pirie informed him that payment on the checks could not be stopped and after some delay the order of stoppage was released. It was too late for the Acme company, however, for the checks of Devlin that had been returned unpaid by his bank caused the creditors to descend upon the company, eventually throwing it into bankruptcy.

Then the defendants declined to pay their notes to Pirie and suit was brought against them in the Supreme Court. These were heard by Justice Blanchard, who decided that defendants were liable to Pirie for the amount of their notes with interest.

Auto Lighter Co. Asks for Injunction

COLUMBUS, O., Dec. 7—Alleging infringement of patent rights, the Auto Lighter and Equipment Company, of Boston, has asked the United States court to enjoin further sales of a device for automatic gas ignition manufactured by the Inst Lighter Company, of Columbus. F. C. Barger and Byron L. Barger are president and secretary of the local company, which has an office at 55 1-2 East Main street.

Daimler Levies Upon French Firms' Exhibits

In consequence of certain claims for violation of its patents and difficulties in obtaining judicial satisfaction for these claims in French courts, the Daimler Motoren Company of Stuttgart-Untertuerkheim at the conclusion of the recent automobile show in Berlin had the sheriff levy upon and take possession of the exhibits of the French firms Clement-Bayard, Mors and La Buire, subject to release against bonds.

Madero to Urge Good Roads in Mexico

MEXICO CITY, Dec. 1—Automobilists and others in Mexico are greatly interested in the announcement by President Francisco I. Madero, Jr., that one of his policies will be to promote the construction of good roads throughout the republic. There are already several splendid highways in the federal district.

The favorite highway for automobile pleasure seekers of the capital is that which runs between this city and Toluca. The distance is 45 miles, and the route lies through grand scenery.

Automobile highway between Mexico City and Toluca

Late Racing and General News

INDIANAPOLIS, IND., Dec. 4—The annual motor car hill climb of the Evansville Automobile Club, was held at Evansville Thanksgiving Day, a large crowd of spectators witnessing the contest. The Evansville *Courier* offered a silver trophy to the winner of the free-for-all class. While the best time in this class was made by Charles French, driving a Cole, a protest against French receiving the award has been filed with the judges by Armand Emrich, who drove a Marquette-Buick, on the ground that French is a factory driver and a professional. A summary follows:

Free-for-all: Cole, driven by Charles French, first; Marquette-Buick, driven by Armand Emrich, second; time, 48½ seconds.

Cars with 4½-inch bore: Cole, driven by Charles French, first; Knox, driven by Morton Mannheimer, second; American, driven by Elmer Lehnhard, third; time 48¾ seconds.

Cars with 4¼-inch bore: Chalmers "36," driven by G. C. Keck, first; Maxwell, entered by Echert-Maxwell Co., second; time, 54 seconds.

Cars with 4-inch bore: E-M-F, driven by Fred McNeeley, had no competition; time, 58½ seconds.

Cars of less than 4-inch bore: Ford, entered by Korb and Stewart, first; Cameron, driven by Herbert Laubscher, second; time, 1.01¾.

Cars driven by ladies: Cadillac, driven by Miss Beatrice Curry, first; Cadillac, driven by Miss Eloise Koch, second; time, 58 seconds.

Savannah Not Anxious for 1912 Grand Prize

SAVANNAH, GA., Dec. 3—Whether Savannah will ever have another Grand Prize or Vanderbilt race is doubtful. Neither the officials of the Savannah Automobile Club nor Mayor Tiedeman would talk upon the subject, otherwise than to say that they thought Savannah had seen its last automobile race for years to come. To add to the feeling of doubt as to the future, the night following the Grand Prize race was allowed to pass without any attempt to secure the event next year.

The railroads entering the city gave out an official statement in which it was set forth that they handled 30,000 strangers as against 17,000 last year.

Starter Wagner before his return to New York outlined a new 10-mile course which should be easily capable of a speed of 80 miles an hour.

Instead of making the "S" turn which leads to Whitfield avenue, the Montgomery Cross Roads could be connected with Norwood avenue. With this new road both Whitfield and Ferguson avenue with the turns at Montgomery Cross Roads will be eliminated.

Gold Prize for Tour to Dawson

SEATTLE, Nov. 29—Complete rules governing the awarding of a gold trophy for the first automobile touring continuously between Vancouver, B. C., and Dawson (or any other settlement in the Canadian Yukon or Alaska an equal or greater distance north than Dawson), via a continuation of the Pacific highway route, have been issued by the Pacific Highway Association.

This makes the third trophy to be put up by the association for pioneering runs along projected continuations of its route. The first, for the Seattle-Hazelton trip, was won by P. E. Sands; the second, for a tour from San Diego to the city of Mexico, will probably be contested for next Spring or Summer. All these trophies are similar in appearance, being reproductions in gold of an automobile rear wheel engraved around the side of the tire and with space on the brake drum for the winner's name.

The rules for the Dawson tour, covering 19 clauses, are largely similar to those of the other contests. The thirteenth and fourteenth clauses are of special interest. They provide that the route from Vancouver to Lytton must be nowhere more than 10 miles distant from the Frazer river, and that from the start the run must follow wholly within the confines of British Columbia, Alaska and the Yukon. Pacific highway pennants must be carried and a complete set of photos taken en route. A log also must be kept.

Immense difficulty would attend an attempt for this more than 1,400-mile run at present, but with the recent discovery of enormous coal fields in the Groundhog district, 140 miles north of Hazelton, it seems probable that the British Columbia government will begin a wagon road into that country, along the projected Pacific highway route. This, together with the provincial government's activity in behalf of highways and the recently avowed Federal intention of helping roads in the provinces, encourages the promoters of the Dawson run to believe that it can be undertaken with a considerable chance for success within 1 1-2 years.

San Mateo to Have Good Road System

SAN FRANCISCO, Dec. 4—At a recent meeting of the San Francisco Motor Car Dealers' Association the following resolution was adopted:

"San Mateo county, realizing the importance of good roads, and the lack of the same in that county, is coming to the front in the way of bonding itself for $1,500,000 for the purpose of constructing good roads in that county, commencing at the boundary line of San Francisco county and extending to the extreme south of San Mateo county, with cross roads running from the bay to the ocean side. The county surveyor for some time past has been preparing a survey of these roads, and will soon make his report to the county, when the question will come before the proper officials for the passing of said bond issue. The Coast Side Promotion Association and the San Mateo County Development Association are both doing all in their power to bring about this result and to make a success of the bond issue which will come to vote in a short time.

"There have now been granted in the state of California licenses to the extent of 59,000 automobiles, and automobiles are now being sold in the State of California at about the rate of 60 per day, so that the magnitude of this business can be hardly realized. It is a crying shame that San Francisco, the metropolis of the coast, should have such wretched exits as it has on this side of the bay, and it is unnecessary to tell of the great benefits which would be derived from the bond issue in San Mateo county."

Maxwell, McNay's Mechanic, Dead

SAVANNAH, GA., Dec. 4—H. F. Maxwell who was riding as mechanic for Jay McNay, who met his death while practicing over the Grand Prize course here on November 20, died on Sunday afternoon at the Savannah Hospital, where he was confined since the accident. Maxwell was from Jacksonville, Fla. His body has been sent there.

Detroit Items in News of Week

DETROIT, MICH., Dec. 4—The Studebaker Corporation, maker of E-M-F "30" and Flanders "20" motor cars, has inaugurated a radical change in its selling policy that is fraught with a great deal of significance to the industry as a whole. The corporation has decided to sell motor cars on credit and hereafter will accept notes from farmers and other responsible buyers. In explanation of this innovation, Walter E. Flanders, general manager of the Detroit factories of the factories of the Studebaker Corporation, says.

"I believe the motor car business should be placed on a credit basis, and I believe the action we have taken will lead to the most important advance that has been made in the industry since its inception. It indicates that the motor car has now arrived at the stage where it is no longer a high-priced luxury, but has actually become a necessity in the lives of all business men and other well-to-do people. First the motor car business was called a 'game'; now it has attained the dignity of an industry. The motor car itself was originally a play toy, then an expensive luxury for the rich; now it is a staple, a necessity, and as such it should be sold as all other staple articles."

The Studebaker Corporation's action has been the subject of a good deal of discussion among local makers, but whether the example will be followed by others as a fixed policy remains to be seen. That the time is coming when motor cars will be sold as are other staple commodities, to responsible buyers, by the manufacturers generally, is regarded as certain, but there seems to be a doubt in some quarters as to whether the time is ripe for the inauguration of such a policy.

Important changes in the administrative forces of the Lozier Motor Co. are announced. Owing to the rapid growth of the business, it has been found necessary to further divide the responsibility, and in this connection the position of general manager has been created. Fred C. Chandler, second vice-president of the company in charge of sales, who has been associated with the Loziers for the past 21 years, has been advanced to this position. John G. Perrin, who has been identified with the Loziers in various capacities for the past 17 years, has been appointed vice-president and chief engineer. Charles A. Emise, formerly in charge of the advertising department, succeeds Mr. Chandler as sales manager, and Russell E. Benner becomes production manager.

Rapid progress is being made on the new plants and additions under way in this vicinity. At the Ford plant the finishing touches are being put on the mammoth addition and a part of the extra space is already being utilized. The Hupp Motor Car Co. expects to have its new Windsor branch factory in operation by January 1. It will have a capacity of 2,000 cars per year. The company's new local plant is well under way. The company expects to move into one department this month, and the factory will be completed some time in January, according to present indications. It will have a capacity of 15,000 cars per year. The old plant on Jefferson avenue is turning out cars right along and is not storing any. The Cadillac Motor Car Co. has just let the masonry contract for a new storage building at its plant. The remainder of the work will be done by the company itself.

Knell & Adams, automobile body finishers, have practically closed a deal for the purchase of a two-story factory building at 1039-1043 Jefferson avenue, which will increase the company's facilities 100 per cent. after contemplated alterations are completed. The company is now located at 1020-1030 Beaufait avenue, and this plant will be continued. The newly acquired property was formerly used for an overall factory. It is understood that the purchase price agreed on is in the neighborhood of $50,000.

That the Mexican government is awakening to the commercial and industrial possibilities of the motor car is evident from the fact that it has just commissioned two of its engineers, Ernestra Silva and Eduardo D. Escobar, to study motor car building in this city. The men have been given positions in the plant of the Hudson Motor Car Co. and will learn the business from the ground up, under the direction of Howard E. Coffin. They began their apprenticeship in the "rough test" department.

The Hudson Co. furnished the motor cars for conveying a party of western governors about the city of Detroit on Thanksgiving day.

George D. Wilson, sales manager for the Warren Motor Car Co., has just returned from an Eastern trip in the interests of the company and says that the outlook for future trade in that section is more promising than it has been in any previous year at this season.

J. B. Eccleston, sales manager for the Oakland Motor Car Co., of Pontiac, has left for an extended trip through the West to visit Oakland dealers and get a line on conditions. He will be gone about a month.

Everitt Banqueted by Agents

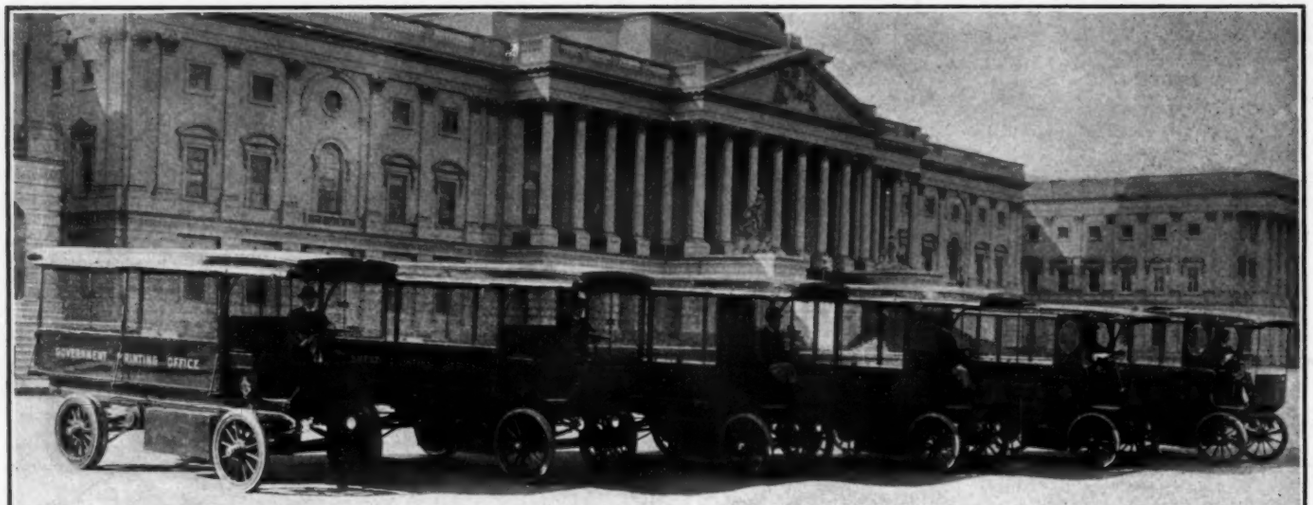
PHILADELPHIA, Dec. 4—B. F. Everitt, president of the Metzger Motor Car Company, manufacturers of the Everitt line of cars, and Wallace C. Hood, sales manager of the factory, were the guests last evening of W. Wayne Davis, who handles the Everitt in this territory, at the newly-remodeled showrooms of the local branch, Nos. 600-602 North Broad street. About fifty all told were present at the housewarming, composed of subagents of the Everitt from Pennsylvania, New Jersey and Maryland, and local newspapermen. Speeches outlining the policy of the company were made by Mr. Everitt, Mr. Hood and Mr. Davis. The headquarters of the W. Wayne Davis Company were beautifully decorated and music further added to the enjoyment of the occasion.

Hoosiers Have Horseless Fire House

INDIANAPOLIS, Dec. 4—After experiments covering more than a year, which have resulted satisfactorily, the Indianapolis board of public safety has announced a policy of replacing the horse-drawn equipment in the fire department with motor-drawn equipment as rapidly as possible. At first such installations are to be largely in the districts having paved streets, although experiments are now about to be made with such equipment in districts where there are some unimproved streets.

Equipment, consisting of a gasoline combination hose and chemical wagon, has been ordered for a new fire engine house being erected in Thirty-eighth street, in a residence district where there are few improved streets. This will be the first engine house in the city having no provision for horses and thus the first step toward motorizing the fire department.

Before February 1, 1912, it is planned to install a motor combination hose and chemical wagon in engine house No. 5 in Fifteenth street and to replace the hose wagon at engine house No. 20 in Beville avenue with motor equipment. It is also planned by that date to install motor equipment in engine house No. 25 in Irvington, in which are now stationed a horse-drawn hose wagon and ladder truck.



NEWS of the WEEK CONDENSED

Installation of Baker electric commercial cars recently delivered to the United States Government

WASHINGTON, D. C.—The Baker Motor Vehicle Company, of Cleveland, O., has recently delivered two delivery wagons, two light trucks and two heavy trucks to the United States Government for the use of the Bureau of Printing and Engraving.

CASPER, WYO.—The Shulte Hardware Company has taken the Cadillac agency.

DENVER, COL.—The Alkire Motor Car Company has taken the agency for the Thomas flyer.

KANSAS CITY, KAN.—The A. J. Davis Motor Car Company has removed to 1710 Grand avenue.

KANSAS CITY, KAN.—The Motor Tire & Supply Company has removed to 1708 Grand avenue.

DENVER, COL.—The Carstarpen Electric Company has taken the agency for the Flanders electric.

WICHITA, KAN.—The Cole Motor Company has moved into new quarters at First and Water streets.

OMAHA, NEB.—The Powell Supply Company has taken the agency for Republic tires for this territory.

OWENSBORO, KY.—Lee Brothers have sold their garage on St. Ann street to R. G. Jesse and J. M. Miller.

NEWARK, N. J.—The Oakland Sales Company has been organized to handle the Oakland car in this vicinity.

OMAHA, NEB.—The Moline Automobile Company has opened a branch in this city with D. M. Deal as manager.

SPOKANE, WASH.—Harry Bell, a well-known automobile dealer of this city, has added the Mitchell to his line.

WILKES-BARRE, PA.—The Deitrick automobile agency of this city has taken the agency for the National 40.

DENVER, COL.—G. A. Maxwell and F. Chamberlin have taken the Western distributing agency for the Haynes car.

DENVER, COL.—The Esterline car is now represented here by the Western Engineering & Specialty Company of 1732 Glenarm street.

CHICAGO, ILL.—E. Ruelbach has joined the sales force of the United Motor Chicago Company. Mr. Ruelbach will sell the Columbia car.

CLEVELAND, O.—The V. R. Hall Automobile Company, state distributor for the Cartercar, has opened its new salesroom on Euclid avenue.

WASHINGTON, D. C.—A new garage has been opened at 96 West Maiden street by Thomas O'Rorke, who will handle the Overland in this territory.

BIRMINGHAM, ALA.—D. J. and W. T. Fox have secured the agency for the Matheson car and have opened a garage at 321 South Twentieth street.

BINGHAMTON, N. Y.—The New York Sales Company will handle the Rambler in Broome, Chenango and Tioga counties during the coming year.

HARLAN, IA.—The Booth Implement Company of this city has let the contract for the erection of an automobile garage to Alexander Smith of this city.

CINCINNATI, O.—The Kruse Motor Company has appointed Scott Socars agent for the Maxwell in Adams county. A subagency has also been established at Lexington, Ky.

WILMINGTON, DEL.—The Autocar Company, of Admore, Pa., has opened maintenance headquarters at 714 Orange street. J. P. Harvey is in charge.

OMAHA, NEB.—The Velie Automobile Company is erecting a new garage at Tenth and Howard streets which will be completed early in December.

SYRACUSE, N. Y.—W. King Smith has taken the agency for the Moon car for this vicinity. Mr. Smith also handles the National and Pierce-Arrow.

SCRANTON, PA.—The name of the local agent for the Cole car has been changed from the Penn Auto Company to the Scranton Penn Auto Company.

JOHNSTOWN, N. Y.—H. S. Bowler has become associated with the St. Charles garage and in the future will have charge of the mechanical department.

SAN ANTONIO, TEX.—The United States Tire Company is preparing to open a branch in this city. It will be situated at 433 Main avenue with F. D. Welch as depot manager.

FORT WORTH, TEX.—Joseph Radcliffe & Sons have completed the equipment of their new automobile repair shop at Second and Throckmorton streets and it is now in operation.

SYRACUSE, N. Y.—T. A. Young, of this city, has taken the agency for Onondaga and Cayuga counties for the R. C. H. car, manufactured by the R. C. Hupp Motor Car Company, of Detroit, Mich.

MILWAUKEE, WIS.—The city of Milwaukee oiled exactly 71 miles of streets during 1911, or 50 per cent. more than in 1910. The cost of oiling for 1911 is $.0402 per foot as against $.0550 in the previous year.

YOUNGSTOWN, O.—The Motormart has just completed arrangements whereby it secures the dealership in Franklin cars in this territory for the coming season.

CANTON, O.—The A. H. Wilson Motor Car Company, of this city, located at 516 North Cleveland avenue, has taken the 1912 agency for the Cadillac and the Detroit Electric.

KIEL, WIS.—The Motor Car Company of Kiel, incorporated with a capital of $10,000, will establish a garage and repair shop at once. The concern is negotiating for agency lines.

DENVER, COL.—William Pete has assumed the managership of the Fry & McGill Auto Supply Company of this city, succeeding John Fry, who is now sales manager of the local Everitt branch.

SAN ANTONIO, TEX.—The Taxicab Company has filed an amendment to its charter changing its name to the San Antonio Transfer & Taxicab Company and increasing its capital to $30,000.

KANSAS CITY, KAN.—The Karshner Motor Car Company is now occupying handsome new quarters at Thirteenth street and Central avenue. The company handles the Warren and Speedwell cars.

WINNIPEG, MAN.—The Tudhope-Anderson Company, of this city, Canadian distributor for the Everitt car, has opened branch houses at Brandon, Man.; Swift Current, Sask., and Gorkton, Sask.

KANSAS CITY, KAN.—The Diamond Rubber Company has opened a branch at 1316-18 Grand avenue, in charge of J. F. Lanier, who will also have charge of the branch houses at Omaha and Oklahoma City.

WINNIPEG, MAN.—The Breen Motor Company is occupying its new salesrooms and service station at the corner of Broadway and Sherbrooks street. The company handles the Cole car in this territory.

MILWAUKEE, WIS.—The Smith-Hoppe Auto Company has moved into its new salesroom at 215 Wisconsin street. The company is agent for the R. C. H., Oakland, Oldsmobile and Hupp-Yeats electric.

LANCASTER, PA.—Partnership existing between Herbert R. Bowers and Eugene R. Russell, trading under the firm name of the Conestoga Auto Company, has been dissolved. Mr. Russell retains the business.

RACINE, WIS.—The Racine Automobile & Motor Works, which recently established a new garage and shops on State street, handling the Buick line, are engaged in the production of a new type of motor for pleasure cars.

ATLANTA, GA.—John F. Lakin, special representative of the Studebaker Corporation for the entire Southeast, has just been detailed for this territory. He was formerly with the company at Detroit. His headquarters will be in this city.

MISHAWAKA, IND.—The American Castings Company has taken on more employes in its foundry. The company is making castings for automobile concerns in Peru, Goshen, Rockford, Mishawaka and other cities.

DETROIT, MICH.—H. L. Winter has been appointed sales manager for the Federal Truck Company, of this city. Mr. Winter's experience in the automobile business dates from the time when the industry was in its infancy.

ST. LOUIS, MO.—The Banner Rubber Co. of this city has increased its capital stock from $100,000 to $400,000 for the purpose of equipping a much larger plant for the manufacture of automobile tires and other rubber goods.

VICTORIA, TEX.—The Texas Motor Car & Supply Company has let the contract to the Bailey Mills Company of this place for the erection of a two-story addition to its machine shops here. Harry Dilley is manager of the plant.

ST. LOUIS, MO.—Curtis Jack & Truck Company, recently incorporated at Jefferson City, Mo., capital $75,000, will establish a factory here to manufacture a combination hand-truck and jack for handling automobiles in garages.

NEW YORK CITY.—The Henry Manufacturing Company has leased the garage at 141 West Fifty-fifth street. The company will manufacture an automatic device for starting gasoline engines. The initial capitalization is $100,000.

NEW YORK CITY—The Motz Tire & Rubber Company, of Akron, O., has opened a branch in this city at Fifty-fifth street and Broadway. E. P. White, formerly connected with the Goodyear Tire & Rubber Company, is in charge.

BOSTON, MASS.—A. H. Sowers, formerly with the Welch Detroit branch in this city, has joined the sales force of the Jackson agency. Mr. Sowers handled the Jackson in Boston before as a member of the Sowers-Soden Company.

BALTIMORE, MD.—The Goodyear Tire Company is the latest concern to locate in Baltimore's motor-car row. The company is having a residence on Mount Royal avenue near Maryland avenue converted into modern salesrooms.

BOSTON, MASS.—Clifton C. Edwards has been made manager of the local branch of the Marquette Buick in Boston, succeeding George Lighthall. Mr. Lighthall is to represent the company on the road, opening agencies throughout New England.

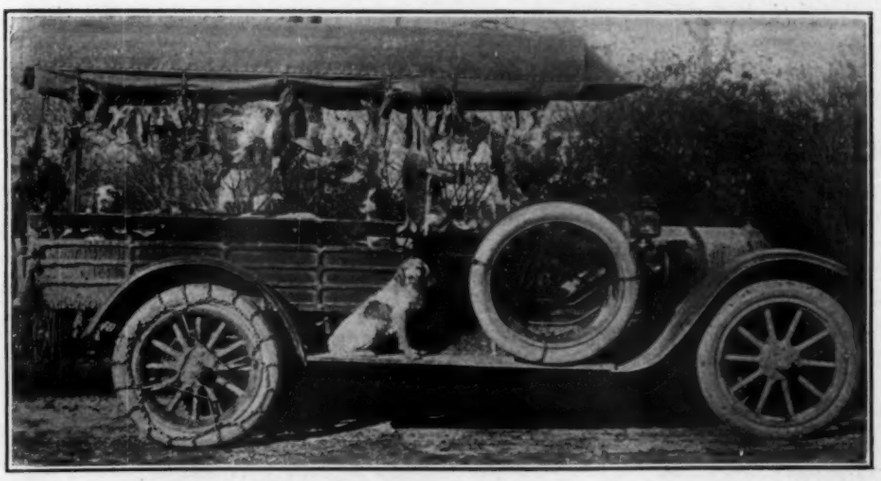
CINCINNATI, O.—The local agency of the Cadillac has opened branch agencies at Ashland, where the Great Eastern Automobile Company will look after the sale of the car, and at Greenville, Ky., where its interests will be cared for by J. E. Upp.

BALTIMORE, MD.—Another car new to the Baltimore field is the De Tamble, which is being handled by Callahan, Atkinson & Company, Charles street, opposite Pleasant street. Callahan, Atkinson & Company are also the representatives for the Locomobile.

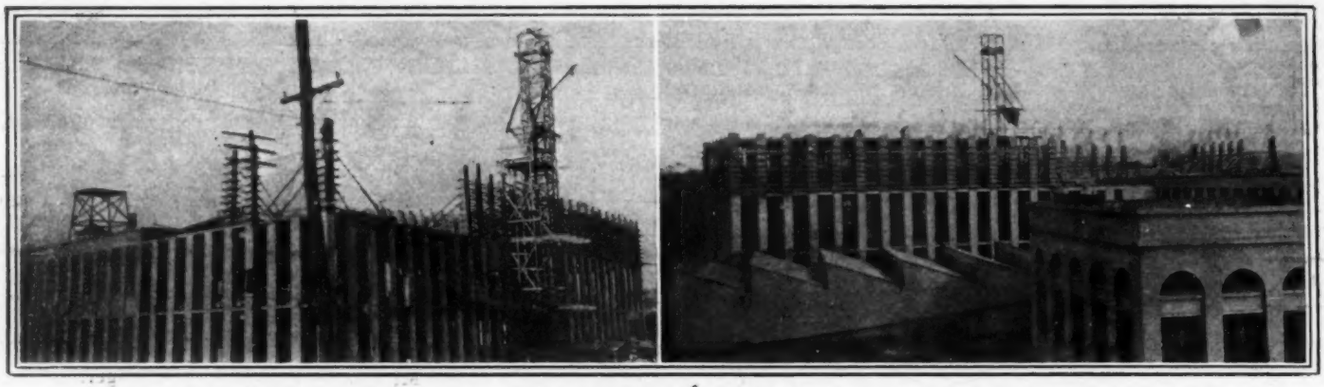
CHICAGO, ILL.—The Velie Motor Vehicle Company has absorbed the Velie Motor Car Company, of this city, and has made it a direct branch. Morton H. Luce, who is in charge of the New England branch, will also act as manager of the Chicago branch.

CLEVELAND, O.—A Boston man has written the White Company, of this city, that he never hunted so comfortably as he now does in his White gasoline truck. He had always used a large touring car until this fall but finds the truck much more satisfactory for hunting purposes.

MISHAWAKA, IND.—The Star Garage is in the hands of a new corporation, the capitalization of which is $5,000. The officers are as follows: Guy Stutzman, president and superintendent; Louis Slick, secretary and treasurer; Marion Pancake, general manager; Charles Renner, sales manager.



How a Boston man uses a White truck in his hunting expeditions



Two views of the new factory now in course of erection for the Rushmore Dynamo Works at Plainfield, N. J.

PORT HURON, MICH.—The Havers Motor Car Company, of which Fred Havers, of Detroit, is president, has increased its capital from $60,000 to $200,000. It is now planned to manufacture 1000 cars next year, the first output having been estimated at 500.

PITTSBURGH, PA.—The Abbott-Detroit Motor Sales Agency has been organized to handle the Abbott-Detroit in this territory. J. A. Stumpenhorst, formerly with the Studebaker Company and later with the E. J. Thompson Company, is president.

COLUMBUS, O.—The Hudson Sales Company, of North Fourth street, has appointed the following sub-agents: E. C. Fogle Automobile Company, Cambridge, Elmore; D. S. Spangler, Thornville, Elmore; R. E. Wildermuth Automobile Company, Pleasantville, Krit.

PHILADELPHIA—The Crescent Garage has taken the agency for the Halladay car, manufactured by the Streator Motor Car Company, of Streator, Ill. The garage will act as distributor for eastern Pennsylvania, and, with T. Sidney Weber, for the state of Louisiana.

BALTIMORE, MD.—The Stoddard-Dayton Auto Company, of Baltimore, has taken the local agency for the Sampson truck. The company will represent the truck not only in Baltimore but throughout Maryland, Virginia and West Virginia, the territory covered by the local company.

DETROIT, MICH.—F. R. Bump has been appointed assistant general manager in charge of the sales, advertising and service departments of the Hupp Corporation. R. T. Wingo has taken the position of assistant general manager in charge of production and will also act as master mechanic and consulting engineer.

PROVIDENCE, R. I.—Robert F. Russell has been appointed assistant engineer of the automobile department of the American Locomotive Company. He will be associated with Montague H. Roberts, chief engineer, in matters pertaining to Alco trucks and cars.

DENVER, COL.—The Mathewson Auto Company has appointed the following sub-agents for the Reo in Colorado: McCune Bros., Las Animas; J. C. Cartwright, Rocky Ford; Royal Garage, Pueblo; Paul's Garage, Colorado Springs; J. B. Smith, Sterling, and O. P. Sells, Alamosa.

RACINE, WIS.—The Mitchell-Lewis Motor Company has borrowed $2,500,000 from banks in Chicago and New York. The purpose of the company is to refund all its banking obligations and to use the remaining capital in opening new departments for the building of tops, bodies and commercial vehicles.

LOUISVILLE, KY.—One of the newcomers in the truck manufacturing field of the Middle West is the Transit Motor Car Company of this city, which is engaged in the building of 2, 3 and 4-ton trucks. The Laib Company has bought one of the 3-ton models, which is arranged for carrying long lengths of pipe.

NEW YORK CITY—H. Boller will give special automobile instruction in German at the automobile school of the West Side Y. M. C. A., Fifty-seventh street and Eighth avenue. Many of the students at the school are German and it was for their benefit that the new course in that language was added to the curriculum.

PUEBLO, COL.—The Byron Motor Company, of Denver, has taken over the plant of the old Pueblo Steel Wheel & Wagon Company and is installing machinery for the manufacture of the Byron truck. The plant will be in operation by January 1, 1912, and will employ 100 men. Its capacity will be 600 trucks a year.

NEW CASTLE, PA.—The annual meeting of the Penn Motor Car Company, Pittsburgh, was held here recently. The following officers and directors were re-elected: President, A. G. Breitweiser; vice president and chief engineer, J. S. Herbert; treasurer, J. J. Keeling; secretary and sales manager, C. E. Gregg.

FOND DU LAC, WIS.—The Fountain City Garage, erected by M. B. Helmer at a cost of $25,000, has been opened for business. It is located at 19-21-23 Fourth street, is 40 feet wide and 115 feet long, two stories and basement, of concrete and brick construction. It is equipped with electric elevators. A complete paint and finishing shop is a feature of the repair department.

LOS ANGELES, CAL.—"Doc" Green, formerly sales manager of the Cadillac agency in this city, who left that concern recently, has taken a position with the Grundy Motor Sales Company. He will be sales manager for the Cole and Paige-Detroit lines, for which the Grundy Motor Sales Company is the southern California agent.

PROVIDENCE, R. I.—George L. Sullivan, recently automobile editor of the *New York Tribune* and identified with the automobile industry for 5 years, has joined the sales department of the American Locomotive Co. of this city. H. C. Whitney, formerly of the Royal Tourist and Gramm forces, has also become connected with the Alco interests as traveling sales representative.

MILWAUKEE, WIS.—The Chas. Abresch Company, Fourth and Poplar streets, has just perfected a new type of sand sprinkler for municipal purposes, which is being tested by the city. The machine sprinkles 50,000 square yards of pavement in an hour, accomplishing the work of fifteen to twenty men with shovels in the same time. But one person is required to operate the sprinkler.

PHILADELPHIA—John North Willys, president of the Willys-Overland Motor Company, of Toledo, was the guest of honor at the informal banquet held recently at the Bellevue-Stratford by the Overland-Marion Motor Company of this city. More than fifty managers and agents of the Overland Company from Pennsylvania, New Jersey, Delaware and Maryland were present.

TORREON, MEXICO.—The guayule rubber industry in Torreon, Gomez Palacio and other towns of this region is seriously affected by the general labor troubles. More than 10,000 workmen in Torreon, Gomez Palacio and Lerdo went on a strike the early part of November and the trouble is still unsettled. The Intercontinental Rubber Company's production will be much reduced on account of the labor difficulties and the general unsettled conditions.

PASADENA, CAL.—The Acme Garage, 78 Green street, opened recently with Amber McKibbin as manager.

KALKASKA, MICH.—J. L. Boyd has taken the local agency for the Ford and will open a garage and repair shop about January 1.

NEW YORK CITY—The Simplex Automobile Co. has moved into its new salesroom at Columbus Circle.

NEW YORK CITY—G. L. Egan has resigned the position of advertising manager of the Motor Car Equipment Co. and has accepted a position with the Catalog Publishing Co.

TACOMA, WASH.—C. G. Arnold is now associated with the Pacific Car Company of this city in the capacity of sales manager. Mr. Arnold was recently in charge of the Olympic Motor Car Company of Seattle.

HARTFORD, CONN.—During the last year the State of Connecticut has received $230,120 from car owners and operators. Most of this sum came as registration fees. The gain over the previous 12 months is $65,000.

OMAHA, NEB.—The Omaha Fire and Police Board has found the combination chemical and hose automobile truck so valuable that it was decided to buy a second one. After receiving bids a Knox car was ordered.

PHILADELPHIA—Benjamin H. Kirkbride, formerly manager of the Reo agency in this city, has taken the eastern distributing agency of the Cutting car. His territory includes Pennsylvania, New Jersey and Delaware.

LOUISVILLE, KY.—The Board of Public Safety of this city has recommended the equipment of an automobile repair shop to take care of the municipal motor cars which have been put in service within the past few years.

SAN FRANCISCO, CAL.—F. L. Chavanne, formerly connected with the local branch of the F. B. Stearns Company of Cleveland, is now associated with the sales force of the Haynes Auto Sales Company of this city, distributor of Haynes and Krit cars.

KANSAS CITY, MO.—Alfred Reeves, sales manager of the United States Motor Company, has succeeded W. S. Hathaway as district manager of the West. Mr. Reeves will continue as sales manager but will have this territory under his personal supervision.

SAN FRANCISCO, CAL.—W. T. Matzer, of Columbus, Neb., accompanied by his wife, daughter and brother, arrived in this city recently in his Buick touring car. The party left Columbus about the middle of September and are on their way to Santa Anna, this state.

APPLETON, WIS.—The Eagle Manufacturing Company has perfected a traction plow which covers 30 acres a day, eight furrows at a time. The company has disposed of part of its other business lines in order to concentrate its entire effort on the engine and tractor business. A large addition to the plant is contemplated.

PHILADELPHIA—The Lee Tiré & Rubber Co., of Conshohocken, will open a branch in this city at 225 North Broad street on Monday, December 11.

NEW HAVEN, CONN.—W. B. Young, recently a member of the sales force of the New York branch of the Ford Motor Co., has accepted the position of manager of the Ford agency in this city.

DETROIT, MICH.—The sales office of the Heinze Electric Co., formerly in Lowell, Mass., has been moved to 870 Woodward avenue in this city in order to bring it into closer touch with the center of demand.

CHICAGO, ILL.—G. Vernon Beck, for several years connected with the Chicago branch of the Studebaker Corporation, in capacity of traveling salesman, has resigned his position to join the sales organization of the Hupp Corporation. Mr. Beck will travel in Illinois and adjacent territory, working with the Chicago branch, of which Mr. H. E. Westerdale is manager.

Automobile Incorporations

AUTOMOBILES AND PARTS

BUFFALO, N. Y.—Buffalo Motor Vehicle Co.; capital, $100,000; to manufacture, sell and repair automobiles. Incorporators: W. R. Hunteley, J. H. Vailm, C. R. Hunteley.

BUFFALO, N. Y.—Pierce-Arrow Sales Co.; capital, $75,000; to sell automobiles. Incorporators: W. J. Minehan, T. D. Powell, H. W. Huntington.

CAMDEN, N. J.—Generating Light & Motor Co.; capital, $125,000; to make engines. Incorporators: J. J. Bradym, G. D. Connelly.

CAMDEN, N. J.—Little Giant Motor Co.; capital, $125,000; to make and sell motor vehicles. Incorporator: William C. Davis.

CHICAGO, ILL.—Motor Bus Co.; capital, $60,000. Incorporators: Clarence E. Morris, James E. Hauronic, Frank P. Page.

COLUMBUS, OHIO.—Dunlap Mfg. Co.; capital, $50,000; to make automobile parts and pneumatic tools. Incorporators: S. M. Dunlap, A. I. Schetenstein, T. C. Dunlap, L. F. Slater, B. G. Watson.

DETROIT, MICH.—Metzger Motor Car Co.; capital, $1,000,000; to manufacture automobiles.

EAGLE GROVE, IA.—Middleton Auto Co.; to sell automobiles. Incorporators: Lyman B. Middleton, Claude E. Middleton.

JANESVILLE, WIS.—Janesville Motor Co.; capital, $20,000; to make and sell automobiles. Incorporators: G. M. Decker, L. J. Davis, A. Schaller.

MOUNT VERNON, N. Y.—Meteor Automobile Co.; capital, $50,000; to manufacture engines and automobiles. Incorporators: F. A. Kately, A. F. Gescheidt, L. Emmeluth.

SAN FRANCISCO, CAL.—Atlas Auto Machine Co.; capital, $10,000; to make automobile parts. Incorporators: I. B. Dalsiel, H. D. Pressy, N. F. Pressy.

ST. JOSEPH, MO.—Joseph Grassfield Automobile Co.; capital, $2,000; to sell motor vehicles. Incorporators: E. A. Grassfield, Geo. Vetuske, F. E. Frank, N. C. Salisbury, W. T. Rainey.

WILMINGTON, DEL.—New York Motor Works, Inc.; capital, $70,000; to manufacture engines.

AUTOMOBILE GARAGES AND ACCESSORIES

CHICAGO, ILL.—Acme Automatic Tire Pump Co.; capital, $50,000; to manufacture and sell automatic pumps. Incorporators: Francis J. Carroll, Emil R. Rosenthal, Francis J. Houlihan.

CHICAGO, ILL.—Fort Dearborn Auto Repair Co.; capital, $1,200; to sell supplies and conduct a repair shop. Incorporators: Albert Campbell, Henry L. Blum, Donald S. McKinley.

CLEVELAND, OHIO.—Metal Body, Tank & Fender Co.; capital, $10,000; to make bodies, tanks, fenders and other accessories and parts. Incorporators: Charles C. Meyer, Arthur J. Peet, C. J. Robinson, B. A. Perkins, E. J. Hartman.

INDIANAPOLIS, IND.—General Specialty Co.; capital, $40,000; to make tires. Incorporators: C. F. Gregg, R. E. Gregg, W. W. Gregg, J. E. Coulter.

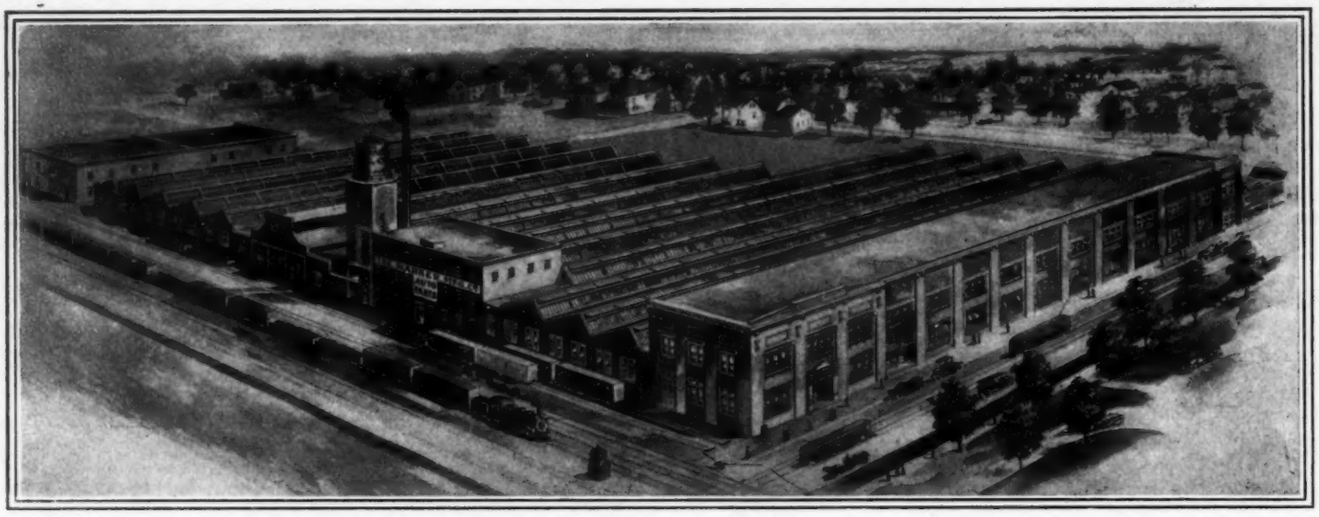
NEW HAVEN, CONN.—Knight Garage Inc.; capital, $15,000; to conduct a general garage business. Incorporators: Harry T. Hotchkiss, George E. Tester, Pierrepont B. Foster.

NEW YORK CITY.—Cosmopolitan Motor Co.; capital, $10,000; to conduct a garage. Incorporators: John J. Kirby, Albert G. Armento.

PHOENIX, ARIZ.—Milwaukee Auto Specialty Co.; capital, $75,000; to manufacture automobile accessories. Incorporators: William J. Schubert and others.

New branch house of the Lozier Motor Company in Cleveland, Ohio

OF INTEREST to the INDUSTRY



Bird's-eye view of the immense plant of the Warner Manufacturing Company, at Toledo, Ohio

TOLEDO, O.—The Warner Manufacturing Co. has completed its new plant which has the capacity for an annual output of 40,000 sliding-gear transmissions and 40,000 steering gears.

GALT, ONT.—Canadian Motors, Ltd., is erecting a factory in this city, to cost $4,000.

TORONTO, ONT.—The Russell Motor Car Co. is building a factory in this city, to cost $30,000.

LOUISVILLE, KY.—The Longest Bros. Co., of this city, has completed the equipment of its shops for the manufacture of motor trucks.

NEW BRITAIN, CONN.—The Corbin Screw Co. is manufacturing a newly patented speedometer for automobiles along with its other products.

DETROIT, MICH.—Kahn & Wilbay, architects, are preparing plans for a one-story addition to the plant of the Chalmers Motor Co. The structure is to be 177 by 70 feet and will cost $25,000.

BROCKWAYVILLE, PA.—The Universal Electric Manufacturing Co., of this city, will manufacture among other electrical appliances the Universal Electric Motor, of which Dr. E. B. Cotten is the inventor.

DETROIT, MICH.—The Cadillac Motor Car Co. has awarded contract through R. D. Raseman, architect, for the construction of a large warehouse and a three-story brick power-house adjoining its present plant.

NEW CASTLE, IND.—The Whiteside Motor Truck Co., formerly of Franklin, Ind., has been reorganized and recapitalized and is now located in this city, where it purchased the plant of the Safety Shredder Co. The new plant will enable the company to turn out 1,000 cars per year.

APPLETON, WIS.—The Valley Iron Works has made a large installation of the oxhydric cutting and welding apparatus manufactured by the American Oxhydric Co., of Milwaukee, and will do automobile and truck repair work in this territory.

OSHKOSH, WIS.—The Termaat & Monahan Co., manufacturing gas and gasoline engines and motors, has purchased the Oshkosh Boat Works site and is erecting a new foundry, to be L-shaped, each wing 50 x 125 feet in size. The present foundry will be added to the machine shops.

INDIANAPOLIS, IND.—The Premier Motor Manufacturing Co., of this city, has begun the manufacture of gasoline motor trucks. The recent enlargements to the plant of the company enable it to take care of a substantial truck business in connection with the manufacture of pleasure cars.

DERBY, CONN.—The United States Rapid Fire Gun & Powder Co. is changing part of its shell department's quarters into a factory for the manufacture of the Westinghouse air spring for automobiles. George Westinghouse is the inventor. The device consists of a piston which works against a cushion of air in a vertical cylinder.

ALEXANDRIA, VA.—V. M. Palmer, formerly superintendent and chief engineer of the Selden Motor Vehicle Company, of Rochester, N. Y., and recently chief engineer and manager of the automobile department of the Sheldon Axle Company, Wilkes-Barre, Pa., has taken the position of factory manager and chief engineer for the B. F. Board Motor Truck Company, of this city.

RACINE, WIS.—Three new departments will be established at once by the Mitchell-Lewis Motor Company, of Racine. One will be for the production of commercial vehicles, the second for the manufacture of bodies and the third for the manufacture of tops. Heretofore its bodies have been built in Milwaukee and Racine by outside interests. The line of commercial cars will include a light delivery car and a general utility farm truck. The total production of all cars for 1912 will be 6,000, the largest in the history of the concern.

DETROIT, MICH.—Although November is usually the dullest month in the year for the industry, the Chalmers Co. has been putting on additional men during the past two weeks and is spending considerable money in the way of betterments. It has just completed a large extension to the motor assembly department and is now installing increased facilities for the testing of motors. The pressing need for additional manufacturing space has made it necessary to move all the offices to a lower floor, crowding them in together. In addition to these changes the company is preparing to erect a new warehouse.

MISHAWAKA, IND.—The Simplex Motor Car Co. has decided to manufacture a moderate priced car and the engineering force is now at work on plans which, when completed, will be turned over to the mechanical department. The new car is to be known as the 40 Baby Amplex and will be equipped with a five-passenger body. The engine to be installed in the new car will be of the four-cylinder, two-cycle valveless type. The capacity of the plant will be increased from the present output of 300 cars to 1,300 cars per annum. Of the 1,300 cars turned out 1,000 will be of the Baby Amplex model.

PATENTS GONE TO ISSUE

CLUTCH—In which cross heads held under tension by springs keep the clutch members in engagement.

3. In this mechanism (Fig. 4) an annular member is keyed to a shaft on which also a revoluble element is loosely journaled and provided with a casing surrounding the annular member. The casing has a number of outwardly radial-projecting boxings, in which spring-tensioned heads are slideably located. Clutch members having fiber clutch shoes are provided with link connections with the cross heads to engage the annular member, when the revoluble element is revolved. Means are provided between portions of the cross heads and the links, which hold the clutch members steadily in engagement with the annular member.

No. 1,009,219—to James C. Boyle, Calgary, Alberta, Canada. Granted November 21, 1911; filed May 17, 1911.

AUTOMOBILE HEATER—Device for heating the interior of closed types of car.

3. The patent relates to the combination of a frame, to the bottom and top of which plates are attached, with heat insulating material on the lower plate and on the frame, frame and plates being so arranged as to form a chamber between upper plate and insulating material. Strips extend from one side of the frame to the other and rest of the sides of the frame and on the heat-insulating material. Supports are provided in the chamber between upper plate and strips and means to hold plates and strips to the supports and to force the strips down onto the insulating material so as to maintain the latter in place.

No. 1,009,052—to Otto Cullman, Chicago, Ill. Granted November 21, 1911; filed December 14, 1910.

VALVE—Double cylindrical type of sleeve valve is reciprocated in the cylinder.

5. In this engine (Fig. 1) a stationary sleeve is fitted in the valve casing which has a delivery passage to the cylinder. The sleeve has delivery and exhaust ports aligned with the delivery passage. A hollow cylindrical valve is mounted to reciprocate in the sleeve, having ports which lead from the interior to the outer surface of the sleeve. These ports are adapted to register with the delivery ports in the sleeve when the exhaust ports are closed by the valve. A ring fits closely around the valve and is carried by it through a portion of its stroke, and means are provided to limit the movement of the ring to a fixed space, so that the exhaust gases are prevented from passing into the body of the valve while the ports therein are passing into the body of the valve while the ports of same are passing the delivery ports in the sleeve on the stroke of the valve conforming to compression and power stroke of engine.

No. 1,009,599—to Charles N. Teetor, Hagerstown, Md. Granted November 21, 1911; filed August 17, 1911.

HEADLIGHT ADJUSTER—Arm and leverage connection for regulating the position of a headlight on an automobile.

1. The patent refers to a lamp (Fig. 2) mounted with provision for horizontal oscillative movement, an arm being connected with the laterally moveable steering (front) wheels so as to have a similar angular movement as these wheels, and an intermediate connecting rod having universal pivotal connection with the lamp at a point in line with the axis of oscillative movement. Thereby the rod is rotated about its own axis by the angular movements of the arm aforementioned, transmitting rotation to the lamp in the same direction.

No. 1,009,385—to Frank R. Cunningham, Medford, Mass., assignor to Kendrick & Davis Co., Lebanon, N. H. Granted November 21, 1911; filed December 7, 1909.

GOVERNING DRIVING MECHANISM—Device for regulating the activity of engines.

2. This patent (Fig. 3) relates to the combination with a driving and a driven element, of a flexible power-transmitting coupling between these elements responsive to variations in torque. The coupling comprises a link and a weighted lever, power regulating means being connected to the lever as well as means whereby the lever varies in position according to the difference between the driving force and load.

No. 1,009,706—to Geo. A. Weber, Trenton, N. J., assignor to Carl J. Adam, Trenton, N. J. Granted November 21, 1911; filed November 25, 1910.

TAIL-LIGHT AND NUMBER PLATE—Apparatus for displaying number and light.

This patent refers to a device comprising a case with an opening on one of its sides, a bull's eye being provided on one side of the opening. Lighting means are contained in the case, as is a number display plate and elastic means for holding it against the inner wall of the case which has the opening in it. The elastic means consist of a flat spring having a number of bearing faces engaging the inner side of the number plate next its upper edge, and a similar spring which engages the inner side of the number plate against the lower edge.

No. 1,009,470—to Davis S. Cake, Los Angeles, Cal. Granted November 21, 1911; filed March 16, 1910.

RADIATOR—Being of vertical tube type.

4. This radiator has top and bottom members and side walls having corrugations connected to these members; in the corrugations are located reinforcing members of a U-shaped section, the inner sides of the U-shaped sections being connected by a strut.

No. 1,007,643—To Fred Clare, Preston, Ontario, Canada. Granted October 31, 1911; filed September 14, 1910.

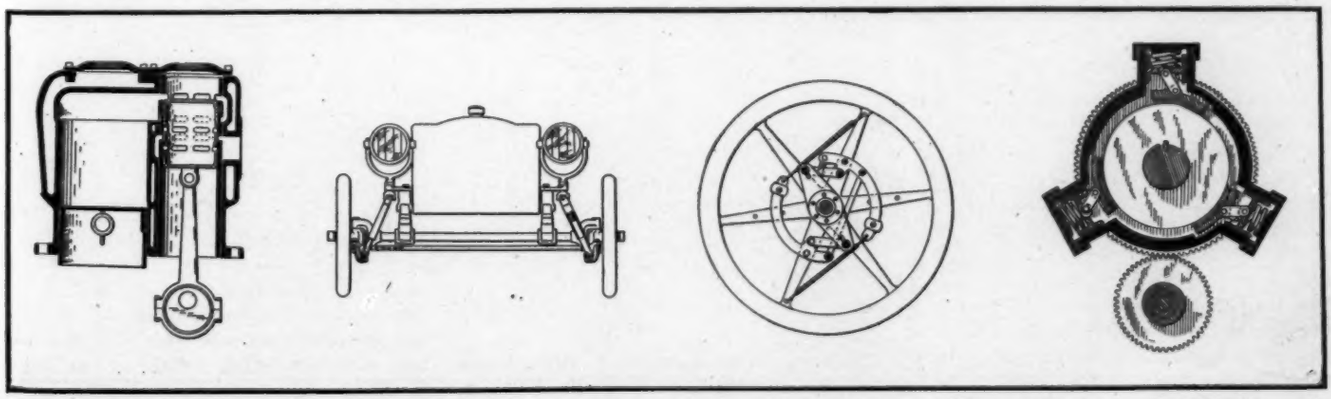


Fig. 1—Teetor sleeve valve. Fig. 2—Cunningham lamp adjuster. Fig. 3— Weber mechanism for drive control. Fig. 4—Boyle clutch

Newest Ideas Among the Accessories

Cinch Repair Kit

THE Cinch tire repair equipment which is illustrated in Figs. 1 to 3 on this page is manufactured by the Cinch Repair Kit Company, of Lockport, N. Y., to enable the motorist to make quick and lasting repairs on inner tubes which have been made useless by blowouts. The exterior view of the kit is seen in Fig. 1. The dimensions of the outfit are 7 by 4½ by 1 inches, and the case in which the several tools composing the equipment are kept is of black leather.

The contents of the kit are seen in Fig. 2, showing the case opened and outspread, and thus giving an idea of the neat and compact manner in which the various tools are arranged. Each tool is held in place by a leather strip securely fastened to the case.

Fig. 3 shows the various tools and the plugs which serve for making the repair. The nickel tube contains a dozen plugs, as shown in the figure. These plugs are made of a soft metal skeleton of the form here seen, and the skeleton is covered with solid rubber, resulting in exactly the shape of the plug at the right. Each plug has a flat and a rounded side.

The pliers are so constructed that by their use the plugs may be compressed, resulting in a solid patch as the left one. By the process of compressing the plug its metal stem is crushed and a tight joint is made between the inner surfaces of the two circular sections.

If the Cinch outfit is to be used for repairing a hole in an inner tube it is not necessary to jack up the car and remove the tire from the wheel. All one has to do is pull the damaged portion of the tube out of the casing and then proceed as follows:

The irregular hole is put in shape for the application of the plug. This is done by pushing the point of the cutting tool through the hole in the tube, until a clean round opening is formed therein. The hole made by the tool is much smaller than the diameter of the plug, and a little wider than the stem holding the two round plug sections together. Therefore the wire spreader is used for widening the hole in the tube. The wire is compressed until its two ends come together, after which the instrument is inserted into the enlarged puncture and permitted to widen it.

Then, while the wire holds the hole in a state of tension, the plug is inserted in it with the rounded side outward. Hereafter the wire spreader is withdrawn and the rubber allowed to contract around the stem of the plug. This having been done, the tube is folded so that it is possible to compress the plug by means of the pliers. Then the same operation is done with the pliers reversed, so as to insure equal pressure being dealt to all portions of the plug. When the repair is finished the tube may again be placed back in the tire.

The metal skeleton in the plug has no sharp edges. All the edges are copiously covered with solid rubber, which insures the inner tube against cutting by the metal core. When it is compressed the tensile strength of the rubber plug is many times in excess of the force required to keep the puncture in the tube closed. This is the reason for the Cinch plug being able to keep a tube in a satisfactory state for months after it has been repaired. The application of sheer force in installing the plug has an effect much different from repairs relying upon mere adhesion.

Not only does the plug work well, but the operation of putting it in place is very simple and takes a very short time. If the location of the puncture is known, all one has to do is to pull the damaged portion of the tube out of the casing, apply the plug, return the tube in its correct place and inflate the tire, Excepting the last-named operation, the whole work may be done in about 1 minute, and it is easy enough to be performed by a boy of 8 or 10 years.

The advantages of this kit are manifold. Not only is it handy enough to be carried in the motorist's pocket, without a chance of losing any one of the pieces making up the equipment, but the fact that the use of this kit enables one to make a repair on the road without the application of heat make it a useful accessory. Everybody is not deft nor careful enough to execute a good quick vulcanizing job, but the simplicity of the Cinch outfit makes it a foolproof equipment indeed.

Start-Light Illumination

In the description of the above-mentioned lighting system on page 838 of THE AUTOMOBILE of November 9 the idea was created that in this illuminating system two motions were required for putting the system into action, namely, that it was necessary to throw on the gas and then the igniter for the lamps. This is not so, but a pressure on a single button admits both acetylene and spark to the lights of the car.

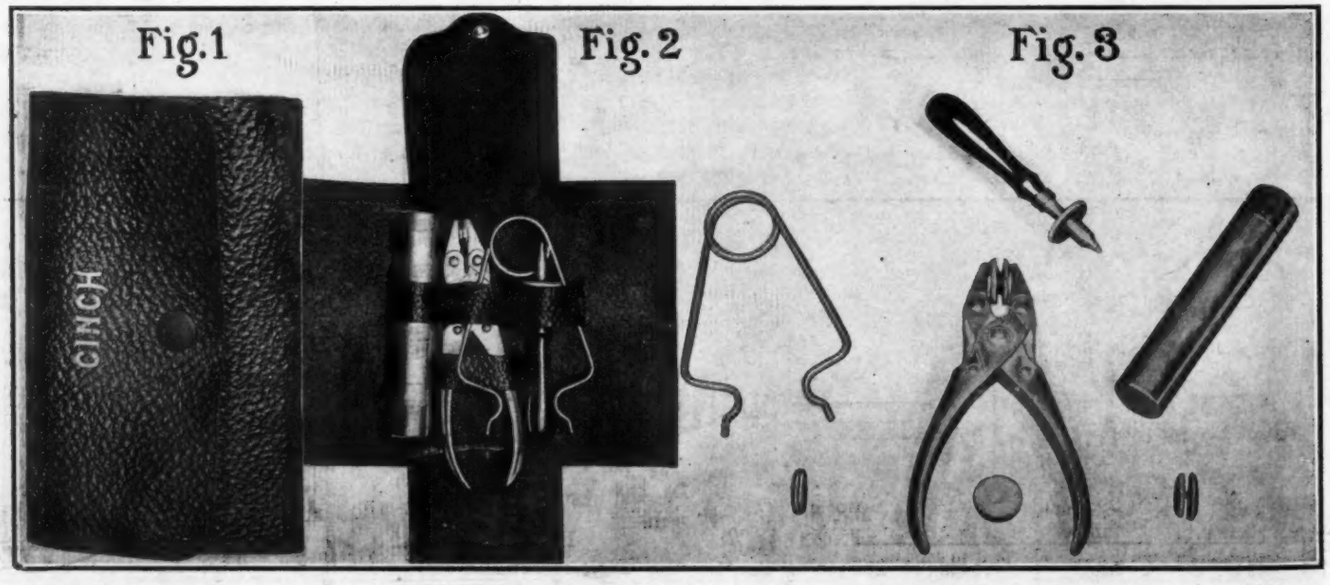


Fig. 1—Outside view of the Cinch tire repair kit. Fig. 2—Kit unfolded showing arrangement of contents. Fig. 3—Display of repair plugs and tools